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INDIAN TRADE ENQUIRY

REPORTS ON
JUTE AND SILK

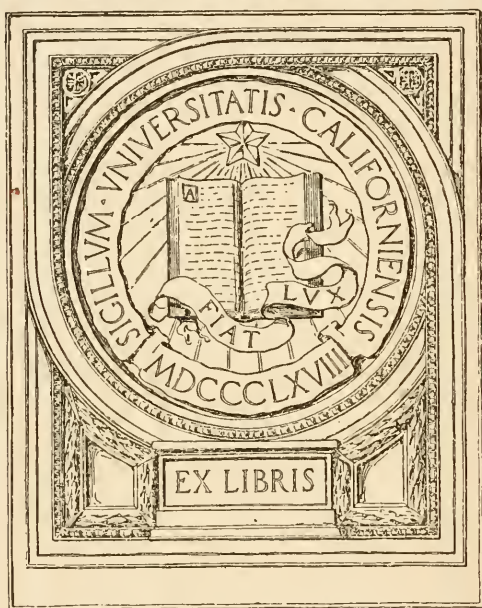


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INDIAN TRADE ENQUIRY

REPORTS ON JUTE AND SILK

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REPORTS of the INDIAN TRADE ENQUIRY

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JUTE AND SILK

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INDIAN TRADE ENQUIRY

REPORTS ON
JUTE AND SILK



LONDON

JOHN MURRAY, ALBEMARLE STREET, W.

1921

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¹ Nominated by the Silk Association of Great Britain and Ireland, Incorporated.

PREFATORY NOTE

IN August 1916 the Secretary of State for India invited the Imperial Institute Committee for India to conduct an enquiry into the possibilities of further commercial usage in the United Kingdom of the principal Indian raw materials. It was also proposed that the enquiry should include the possibility of the usage of these materials in other parts of the Empire.

The invitation was accepted by the Committee for India, and a number of Special Committees were formed to deal with the principal groups of materials selected for inclusion in the Indian Trade Enquiry.

The groundwork for the consideration of the various Committees has been supplied from the information as to the raw materials concerned, which has been systematically collected at the Imperial Institute, chiefly in the Scientific and Technical Department and in the Technical Information Bureau.

The Committees have also had at their disposal the numerous reports made by the Scientific and Technical Department of the Institute during recent years on the composition and commercial uses and value of Indian raw materials, and have also utilised the collections of raw materials of India derived partly from Technical Departments in India and partly from commercial sources which are included in the Indian Section of the Public Galleries and in the Reference Sample Rooms of the Institute.

It has now been decided by the Secretary of State that, subject to certain reservations, the reports of these various Committees which have been forwarded by the India Office to the Government of India shall be published.

The reservations referred to are that, at the request of the Government of India, paragraphs in certain of the

reports as presented should be omitted, such paragraphs being indicated by asterisks, and that it should be stated that the reports represent the personal opinions of the members of the Committees, and that the Secretary of State is in no way committed to accept these opinions.

C. C. McLEOD,
Chairman, Committee for India.

November 1919.

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REPORTS ON JUTE AND SILK

REPORT ON JUTE

THE Special Committee on Jute and other Fibres was appointed by the Committee for India of the Imperial Institute to investigate, in connection with the Indian Trade Enquiry, the possibility of an increased usage of Indian jute in this country after the war ; and to consider what steps should be taken to secure in fullest measure to the British Empire the advantages accruing from the monopoly in the production of raw jute.

The Committee has held several meetings. At a conference held at Dundee, at which J. E. Cox, Esq. (Messrs. Cox Bros., Ltd.), L. C. Macintyre, Esq. (Messrs. J. & A. D. Grimond, Ltd.), and F. D. S. Sandeman, Esq. (Messrs. F. S. Sandeman & Sons, Ltd.) were present, opinions were taken in regard to special matters upon which information was desired by the Committee. A summary of the evidence is appended.

The Committee desire to express their best thanks to these gentleman for the valuable assistance they have rendered to the Committee in their enquiry.

INDIAN JUTE : GENERAL STATEMENT

The Committee are of opinion that the facts in regard to the monopoly enjoyed by the Empire through the production of jute in India ; the apparent impossibility of the extensive production of the fibre at competitive prices in other countries ; and the failure hitherto to discover suitable artificial substitutes at satisfactory prices, are so well known that it is unnecessary for them to traverse this ground in detail. They recognise, however, that the perfection of a simple chemical and mechanical method of

removing the fibre from the stem might eliminate much of the difficulty hitherto experienced in establishing jute cultivation as a commercial undertaking in countries other than India, and note with interest that the possibility of improvements in the extraction of the fibre is to be kept in view in India.

The commercial production of jute is confined to India, the areas concerned being Bengal, Bihar and Orissa, Assam, Cooch-Bihar and Nepal. The fibre is obtained from the inner bark of the stems of *Corchorus capsularis* and *C. olitorius*, annual plants belonging to the natural order *Tiliaceæ*. The former is the more important species, and in the northern and eastern districts of Bengal is almost exclusively grown; while the latter, which is grown on land not subject to inundation, is extensively cultivated in the Hooghli and twenty-four Parganas districts and in Western Bengal.

The crop is raised on small holdings by the Indian ryot, from whom it is purchased by the marwari dealers and large European firms, the latter being the more important. Attempts made by Europeans to cultivate jute on a large scale have not so far proved successful.

Over 60 per cent. of the total crop is consumed in the Indian jute mills, the remainder being exported chiefly to the United Kingdom, Germany, the United States, France, Austria, Italy and Spain. Other continental countries take less important quantities.

The fibre is used chiefly in the manufacture of coarse textiles (gunny bags, hessians, scrim, etc.); as backing for linoleum; for carpets, rugs and matting; thread, twine and cordage; and in admixture with other fibre for a large variety of fabrics. Jute "butts" and waste jute are employed to a small extent in the manufacture of certain classes of paper. In general, the cheaper classes of goods are manufactured in India; while Dundee, in virtue of the skilled labour available, has specialised in the finer qualities of fabrics, in addition to producing some lower grades.

Acreage and Production.—The area under the crop and the production of fibre for the years 1911 to 1917 are officially returned as follows:

Year.	Area. Acres.	Production. Tons.
1911	3,106,400	1,470,500
1912	2,970,500	1,757,500
1913	2,911,000	1,588,000
1914	3,358,700	1,865,000
1915	2,375,900	1,312,000
1916	2,702,700	1,483,000
1917	2,729,700	1,579,000

Details of area and production by provinces for 1911-17 are given in Appendix A, Tables I and II.

The relative importance of jute as compared with the three chief crops of India will be seen from the following figures. The position of jute in regard to the market value of produce per acre is of special interest, even when allowance is made for intermediate charges and middlemen's profits, which are probably higher for jute than for the other crops in question.

TABLE SHOWING MARKET VALUE OF PRODUCE PER ACRE FOR RICE, WHEAT, COTTON AND JUTE IN INDIA

(Average figures for ten years, 1904-13 inclusive)

Crop.	Area. Acres.	Yield.	Yield per acre. Maunds.	Wholesale price per maund.	Market value of produce per acre.
Rice	569,895,465	24,025,303 tons	11.5	Rs. 4.75	Rs. 54.62 = £3 12s. 10d.
Wheat	28,145,474	8,752,354 tons	8.4	Rs. 3.73	Rs. 31.33 = £2 1s. 9d.
Cotton	20,979,500	3,836,966 bales (685,173 tons)	0.88	Rs. 28.3	Rs. 25.04 = £1 13s. 4d.
JUTE	3,114,420	8,298,590 bales (1,481,891 tons)	12.9	Rs. 9.68	Rs. 128.79 = £8 11s. 8d.

Export from India.—The distribution of the export of jute from India from 1911-12 to 1916-17 is shown in Table III.

It will be observed that in recent years India has exported more jute to Germany than to any other country except the United Kingdom. To the amount quoted in this table must be added the quantity imported into Germany from other countries receiving jute from India,

the principal re-exporting country being the United Kingdom. Previous to the war about one-third of the total import into the United Kingdom was re-exported, chiefly to continental countries, and of this amount between 23,000 and 30,000 tons per annum were sent to Germany. According to German returns, the average total import of raw jute into Germany, including the amount received from the United Kingdom, for the three years previous to the war, amounted to 146,746 metric tons per annum (deducting re-exports), as against 218,962 tons retained in the United Kingdom for manufacturing purposes. Including the corresponding amount consumed by Austria-Hungary the average annual quantity of raw jute retained by the principal enemy countries during the period in question was 203,937 metric tons per annum. The official German returns (so far as available) for the imports of jute into that country for 1910-13 are shown in Table V, and the corresponding figures for Austria-Hungary in Table VI. Details of the British re-exports are given in Table VII. Imports of raw jute into the United Kingdom are given in Table IV.

Consumption of Jute in different Countries.—India is by far the most important jute-consuming country. In the three years 1914-15 to 1916-17 the average proportion of jute retained in India was 64·6 per cent., as compared with 50·9 per cent. for the three years 1904-5 to 1906-7.

Comparison over a period of years of the exports of jute from India to the principal consuming countries shows that the important advance made by several foreign countries has not been paralleled by the United Kingdom, where much smaller progress has been made. The figures for the periods 1901-2 to 1903-4, as compared with 1911-12 to 1913-14, are as follows :

EXPORTS OF RAW JUTE FROM INDIA

To	1901-2 to 1903-4.	1911-12 to 1913-14.	Percentage	
	<i>Tons.</i>	<i>Tons.</i>	+ or -	
United Kingdom	295,093	325,601	+	10·3
France	81,176	75,775	-	6·7
Italy	26,306	37,352	+	42·0
Spain	9,130	23,364	+	155·7
United States	103,558	113,987	+	10·1
Germany	130,515	169,739	+	30·0
Austria-Hungary	35,622	49,208	+	38·1

On account of re-exports, and imports from other countries, the percentage variations shown above do not indicate the position in regard to amounts of jute actually retained for manufacturing purposes in the countries mentioned. The following table compares the position in this respect for the periods 1901-3 and 1911-13.

CONSUMPTION OF RAW JUTE, 1901-3 AND 1911-13

Country.	Period.	Average consumption.	
		Metric tons.	Percentage. + or -
United Kingdom . . .	1901-3	216,908 ¹	+ 0.9
	1911-13	218,962 ¹	
France	1901-3	90,799	+ 10.0
	1911-13	99,897	
Italy	1901-3	24,428	+ 55.0
	1911-13	37,864	
Spain	1901-3	16,021 ²	+ 74.1
	1911-13	27,903	
United States . . .	1901-3	103,935 ¹	- 6.6
	1911-13	96,977 ¹	
Germany	1901-3	116,483 ³	+ 25.9
	1911-13	146,746	
Austria-Hungary . .	1901-3	44,551	+ 28.3
	1911-13	57,191	

¹ Long tons.² 1901 and 1902 only.³ 1901 only.

Jute Manufactures.—The distribution of the jute manufactures of the principal countries has been estimated approximately as follows :

DISTRIBUTION OF JUTE MANUFACTURES

(Averages for 1911, 1912, 1913)

Country.	Retained.		Exported.	
	Per cent.		Per cent.	
India	40		60	
United Kingdom . . .	52		48	
France	83		17	
Italy	77		23	
Russia	100		0	
Belgium	—		—	
United States	100		0	
Germany	95.5		4.5	
Austria-Hungary . . .	82.5		17.5	

1. Export Duty.—The Committee, always assuming the adoption of a general policy of preference, regard as of primary importance the imposition of an Export Duty. They desire to incorporate here the considered and unanimous opinion of the Jute Importers, Distributors,

Spinners and Manufacturers of the United Kingdom as embodied in the following document submitted jointly by the Dundee Chamber of Commerce and the London Jute Association to the Bengal Chamber of Commerce in October 1916.

“ MEMORIAL ADDRESSED TO THE BENGAL CHAMBER OF
COMMERCE BY THE DUNDEE CHAMBER OF COMMERCE
AND THE LONDON JUTE ASSOCIATION

“ Jute Trade after the War

“ A strong feeling has existed in many quarters for years, that such an Empire monopoly as jute should be used for the better furtherance of the interests of the Empire. The war has sharpened opinion on this as on many other matters. The jute interests of the United Kingdom are unanimously of opinion that the time has come when full advantage should be taken of this unique situation, and they feel persuaded that opinion in India cannot be very different.

“ The fact that raw jute could be obtained by any country on equal terms with those on which the Indian and United Kingdom mills could purchase their supplies has induced the building of mills in foreign countries, and the putting on of import tariffs to keep out Indian and United Kingdom Jute manufactures. The true remedy for such a situation would seem, at first sight, to be the imposition of a tax on the raw material of an extent equal to that imposed by each foreign country on manufactured jute goods. But in practice that does not seem possible, nor does it now seem desirable. At this time of day to attempt to stamp out the manufacture of jute goods in these foreign countries, and to divert the trade to India and the United Kingdom, seems out of the question, nor could India ever be asked to have its free market for raw material interfered with in such a drastic way. But what *can* be done is not only to make these foreign countries who own jute mills contribute handsomely to the Empire's exchequer, but to ensure that while they will be enabled to carry on the industry so far as manufacturing for their own bonâ fide home trade requirements is concerned, they

will be confined to that, and be unable to export to neutral markets. The same process would remove the inducement which exists in free raw material to the building of mills in countries which have not yet begun jute manufacturing, and the expansion of the trade all are looking for in the future would thus directly benefit the Empire and the Empire's workers. The extent to which continental countries now manufacture jute goods for export does not seem to be fully appreciated. In this growing trade, largely bounty fed, lies a serious menace to the Empire's jute workers. Figures lately submitted by Dundee at the request of the Advisory Committee of the Board of Trade on the Textile Industries of the country prove the extent to which neutral markets are one by one being taken from us, and the Empire's jute being worked up by foreign labour, while the Empire's workers stand idly looking on.

"A tax on raw jute would remove these anomalies, and the suggestion of the jute interests of the United Kingdom is that a tax of not less than £5 per ton be put on all raw jute leaving India, with a surtax of 25 per cent. in the event of shipments taking place in other than British bottoms, a rebate of the full amount of the tax to be made to consumers within the Empire, and no excise or counter-vailing duty to be paid by the Indian mills. £5 per ton is not a sum that would interfere in any way with the carrying on of the jute trade. No country is so situated in regard to soil, climate, water and labour, as to be ever able to compete with India in the raising of jute. The c.i.f. price of jute has fluctuated between £12 and £36 per ton in recent years in ordinary trade conditions, and during the period covered by these fluctuations in price, consumption has rapidly increased, and no successfully competing fibre has been found.

"A duty of £5 per ton is in almost every case less than the minimum duty imposed on ordinary standard jute cloths entering foreign countries. The surtax is necessary because Austria and Italy granted preferential railway rates on jute passing into the interior, provided such jute was brought from India in Austrian or Italian vessels. German buyers generally stipulated that the raw material should be shipped in German vessels, and up

to the outbreak of war the Hansa Line held a monopoly in the direct shipments to Hamburg and Bremen, jute shipped to Germany via London being penalised by extra port dues on arrival at destination.

" It is impossible to recognise in the proposed legislation any possibility of the interests of India or the United Kingdom being harmed in any direction. On the contrary, the benefits would be sure and immediate, and would consist of a large and continuous contribution to the Empire's exchequer by foreign nations, and the extension of jute manufacturing both in India and the United Kingdom.

" In regard to the collection of the tax, it is recognised that the simplest form of procedure is necessary, and the simplest plan would appear to be to tax all jute exported from India, and to grant certificates proving payment. These certificates would form an essential part of the shipping documents. On arrival of the jute in the United Kingdom, the certificates would be endorsed or exchanged by the Customs Authorities here for others certifying that the jute had been landed. These " Landed Warrants " would be equivalent to Demand Drafts on the Indian Treasury, payable in London, and would be cashed by any bank. Re-shipments of jute from the United Kingdom could be made as before, except that the tax would require to be paid to the Custom House previous to shipment.

" The question as to whether a rebate should be granted to our present Allies may safely be left until the situation develops, and until the Government give some lead in that direction.

" On behalf of the Dundee Chamber of Commerce,

(Signed) " WILLIAM LOW, President.

" THOS. H. H. WALKER, Vice-President.

" GEO. C. KEILLER, Secretary.

" On behalf of the London Jute Association,

" C. C. McLEOD, Chairman.

" C. J. RITCHIE, Vice-Chairman.

" E. HENRY, Secretary.

" October 11th, 1916."

India's Views.—The above Memorial was considered by the Indian Jute Mills Association, and their reply is annexed hereto as an appendix. It is a carefully considered outline of the position and has the support of the Calcutta Baled Jute Association, the Baled Jute Shippers Association, the Jute Fabrics Shippers Association, the European Jute Dealers Association and the Jute Fabrics Brokers Association. The Committee of the Bengal Chamber of Commerce have also stated their agreement with the views therein expressed, and recommend their adoption by the Government of India. As the proposals contained in the Indian Jute Mills Association's report do not appear to have in view the question of an increased usage of jute in this country after the war, and the measures which should be taken to secure to the British Empire the advantages accruing from the Indian monopoly in the production of raw jute, it is unnecessary to deal specifically with their recommendations in this Report. We desire, however, to direct attention to the remark in the report by the Indian Jute Mills Association that "IT HAS, HOWEVER, TO BE REMEMBERED IN THIS CONNECTION THAT OBSTACLES WHICH APPEAR FORMIDABLE WHEN VIEWED ONLY IN THE LIGHT OF PRE-WAR KNOWLEDGE AND EXPERIENCE, ARE SEEN NOW TO BE NO LONGER INSURMOUNTABLE."

The Committee, in the course of their enquiries, have been able to verify the statements and figures referred to in the Memorial quoted, and recommend the imposition of an export duty on all raw jute leaving India, with a rebate of 100 per cent. to consumers within the Empire. Apart from the stimulus afforded to the jute manufacturing industry of the Empire, the Committee contemplate a substantial annual revenue. They have laid stress on the importance of an export duty in the interests of the manufacturers and consumers in the Empire, but they do not overlook the fact that it is necessary to pay due regard to the interests of the cultivator also. They believe that these interests could be secured by ear-marking the products of the export duty for expenditure in ways directly advantageous to the jute cultivator, and by liberal expenditure on research into all agricultural questions connected with the cultivation of jute and the production

of pure seed of the species found to be most suitable for any given area. Grants might also be given to suitable areas to encourage the production of allied fibres such as Bimlipatam jute (*Hibiscus cannabinus*).

India is capable of enormous extension in manufacturing, and in considering the question as to whether Britain would be able to cope with its probable share of the additional business available, the Committee are satisfied that the jute manufacturing industry of Dundee is capable of, and prepared to provide, any extension which may be called for as a result of the proposed new arrangements. In this connection it is interesting to quote the following estimate, prepared in 1913, of the annual quantities of raw jute required to maintain the world's jute mills running at the full capacity of their machinery and labour in the year in question. (Fuller details for individual countries are given in Table VIII.)

BRITISH EMPIRE :										Bales.
India	.	.	.	.	.	.	.	.	.	5,000,000
United Kingdom	.	.	.	.	.	.	.	.	.	1,470,000
Other Allied countries (including the United States)	.	.	.	.	.	.	.	.	.	1,924,000
Neutral countries	.	.	.	.	.	.	.	.	.	391,000
Enemy countries	.	.	.	.	.	.	.	.	.	1,252,000
										<u>10,037,000</u>

2. **Production of Jute.**—An abundant supply of jute, at a steady and moderate price, is a most important desideratum for this country and the Empire generally. So far as prices are concerned, the Committee believe this to be in the long run in the interests of the cultivator. Violent fluctuations in price bring a gambling element into the business, which affects injuriously everyone interested in the production and consumption of jute, while it enables some successful speculators to make large fortunes at the expense of all other classes. Moderate but steady prices will pay the cultivator and will be a safeguard against the production of a successful substitute, which, if obtained, would seriously affect large classes in Bengal, and especially in Eastern Bengal, which is so largely dependent for its prosperity on the jute industry. This Committee would accordingly suggest for the consideration of the Government of India measures which

they believe would lead to increased production, improved quality, and moderate prices.

Increased production may be obtained by extending the area under cultivation. This could be done on a large scale in Assam if the labour difficulty could be overcome. Possibly parts of Champaran, Muzaffapore and Bhagalpore might grow jute, and it is not certain that the cultivation of jute has reached its natural limits in Bengal. The wider the area over which the cultivation of jute is spread, the less the chance of the whole being seriously affected by unfavourable weather conditions. There is, however, probably scope for a much larger increase in the quantity produced by increasing the outturn on the area under cultivation. The Committee are aware of the valuable work done by the Agricultural Department and believe that the time is now ripe for applying on the largest possible scale what has already been discovered regarding seed selection, manuring and the best methods of cultivation. The Committee would recommend that jute farms be opened wherever proper supervision can be secured to enable as many cultivators as possible to see with their own eyes what can be done by the best methods to produce large crops of good quality. There should also be as many seed farms as can be properly staffed to propagate pure strains of the best varieties. These should be extended as time goes on till the whole seed supply is under proper supervision. In dealing with this matter it is essential that control should be so strict as to ensure the quality of the seed produced on seed farms either directly controlled by Government or supervised by it. One of the possible measures of assisting cultivators would be to defray the cost of the seed supplied to them either in whole or in part from the proceeds of the export duty on jute. The area required for seed is estimated at about 3 per cent. of the area under cultivation, and the cost of seed for the whole area would be about £300,000.

3. **Distribution of a Short Crop.**—The consumption of jute is so large, and increasing so rapidly, that a short crop would nowadays be a calamity. In such a case it appears necessary to secure to the mills of the Empire, and of our Allies, a prior claim on the supplies available. The

Committee therefore urge that machinery should be set up to deal with such a situation. They suggest as a possible procedure in the circumstances contemplated, the allocation, or proportional allocation, to British Empire and Allied mills of their season's requirements, plus their normal pre-war base stocks ; and the rationing of all other consumers with the surplus jute, if any.

4. Quality of Jute.—It would appear to be established that the falling off in the quality of the fibre reaching this country in recent years is not to be attributed to deterioration of the plant or fibre, but in part to inferior methods of cultivation and preparation. The trade, however, is painfully aware of the defects resulting from fraudulent watering of the fibre, heart-damage and dishonest grading ; and the Committee desire to represent these matters as strongly as possible. They consider that steps should be taken to regulate the amount of moisture added to the jute, thus also reducing the risk of heart-damage. As regards grading they are of opinion that great improvement is possible if effective control be established. They therefore suggest that Press Houses should be licensed by the Government, the fear of loss of licence furnishing an incentive to the native baler to bale honestly. The Committee believe that such Government control would result in a considerable reduction in the percentage of moisture at present found in jute.

5. Bhita Bazaar.—The Committee are agreed as to the prejudicial effect of the operations of the Bhita Bazaar in Calcutta upon the jute industry. While recognising the difficulty of regulating the activities of the Bazaar, the Committee consider that improvement would result if steps in this direction were taken by the Government of India. At the same time it is not improbable that increased production would tend to prevent violent fluctuations and excessive speculation.

ALLIED FIBRES AND JUTE SUBSTITUTES

In the past, threatened scarcity of jute and consequent high prices have resulted in considerable attention being given to certain other bast fibres which sufficiently resemble true jute in their physical qualities as to be used

successfully in place of that fibre. A considerable number of such fibres from different parts of the world have been investigated and shown to be of satisfactory character ; but in the majority of instances questions of cost, scarcity of labour in the country of production, or imperfect preparation, have prevented a recognised position in the market being secured.

Jute substitutes manufactured from paper yarns have also received much attention, especially on the Continent, but previous to the outbreak of war these materials had proved a commercial failure.

Bimlipatam Jute. — Fibre plants occurring in India which have been investigated in this connection include *Hibiscus cannabinus* (Bimlipatam jute), *Sida rhombifolia*, *Urena lobata* and *Malachra capitata*. Of these the most promising is Bimlipatam (Bimli) jute (*Hibiscus cannabinus*), also known as Ambari hemp, Deccan hemp, etc. This fibre is well known to the trade. The plant is cultivated (usually as a mixed crop) in most parts of India, notably in Madras, Bombay, Bihar, Bengal and United Provinces, the fibre being produced on a considerable scale in Madras, where the area under the plant (grown as a pure crop on the East Coast) is stated to vary between 70,000 and 80,000 acres. Over such a wide area the crop could be easily increased, and it is noteworthy that in Madras the difficulties of labour encountered in the jute districts do not occur.

The following table gives the official returns of exports of Bimlipatam jute from Madras since 1901-2 ; the chief ports of shipment are Bimlipatam and Vizagapatam.

Year.	Quantity. Cwts.	Year.	Quantity. Cwts.
1901-2 . . .	36,416	1909-10 . . .	73,375
1902-3 . . .	64,787	1910-11 . . .	61,205
1903-4 . . .	81,279	1911-12 . . .	60,193
1904-5 . . .	177,796	1912-13 . . .	69,700
1905-6 . . .	244,390	1913-14 . . .	440,060
1906-7 . . .	298,411	1914-15 . . .	136,440
1907-8 . . .	98,762	1915-16 . . .	117,340
1908-9 . . .	96,260		

By far the larger part of the export is to the United Kingdom, with important quantities to Germany. The

sudden rise in the exports for 1904-5 to 1906-7 is attributed to the failure of the Russian flax-crop ; and the striking increase for 1913-14 to the shipment of all available supplies in consequence of the closing of local mills. Their re-opening in the following year, combined with a fall in demand, and low values on the Continent, resulted in a large reduction in the export.

The Committee are of opinion that Bimli jute (*Hibiscus cannabinus* fibre) could be used for mixing purposes to a much greater extent than at present, both in Dundee and on the Continent ; and consider that benefit to the trade would result from the extended production of this fibre in India for export. There would be no object in encouraging its production in the great jute-producing areas, but *Hibiscus cannabinus* has the special merit of flourishing under conditions which are not suited to jute, and occurs over wider areas than the jute districts themselves.

In order to trace the progress of the fibre the Committee recommend that separate returns of production and export of *Hibiscus cannabinus* fibre (" Bimli jute," etc.) should be made in future. Exports of Bimli jute as such are not separately recorded in the Annual Statement of the Sea-borne Trade of British India, but are included with ordinary jute.

An investigation of the races of *Hibiscus cannabinus* has been carried out by Messrs. Barber & Finlow, and A. and G. L. C. Howard, and it is stated that efforts are being made at Pusa to cope with the demands for seed of the improved " Type 3 " which has been favourably reported on. The Committee, however, point out that in the past serious complaint has been made by the trade of the amount of sand and mud shipped in Bimli jute as a result of imperfect preparation. They urge that steps be taken to effect an improvement in this respect, and are of opinion that the brittleness which sometimes characterises this fibre could be avoided by more careful retting.

SUMMARY OF RECOMMENDATIONS

In making their recommendations the Committee have kept in view the importance of securing two main objects.

The first is to make use of our practical monopoly of jute to further the interests of the Empire.

The second main object is to increase the outturn, and thereby steady and keep at a moderate level the price of the raw product. The attainment of the first object must depend on the extent to which the general preferential treatment of the various parts of the Empire and of other countries becomes part of our general policy. If the policy is adopted there is no raw product to which it could more easily and advantageously be applied than jute.

These recommendations of the Special Committee may be summarised as follows :

1. An export duty on all raw jute leaving India, with a rebate of 100 per cent. to consumers within the Empire. The annual revenue derived from the duty to be collected by the Government of India, and devoted to the investigation of problems affecting the production in India of jute and allied fibres.

2. The early establishment of a comprehensive scheme for the investigation of the problems affecting the production of jute and allied fibres. The provision of an adequate staff, and the establishment and maintenance of numerous experimental areas among the village communities engaged in jute cultivation are regarded as essential to the success of the scheme.

3. As soon as seed-selection experiments are sufficiently advanced, the Government of India should provide to each grower (and if necessary free of cost) seed sufficient for his season's crop ; and adopt means to ensure as far as possible that none but the approved seed is sown.

4. Machinery should be set up by the Government to deal with the situation arising from a short crop. In that eventuality the supplies available should be allocated, proportionately, to the mills of the British Empire and of the Allies, and other countries rationed with the surplus, if any.

5. Further enquiry is desirable into the question as to whether it is possible to diminish the excessive watering of jute.

6. The establishment of a system of licensing of Press

Houses by Government is recommended ; and withdrawal of licence is suggested as a penalty for dishonest baling.

7. Steps should be taken by the Government to regulate the operations of the Bhita Bazaar.

8. Measures should be adopted to secure an improvement in the condition in which Bimli jute (*Hibiscus cannabinus*) reaches the market. The production of *Hibiscus cannabinus* fibre (" Bimli jute," etc.) should be encouraged ; and statistics of production and export of this fibre recorded separately.

(Signed) C. C. McLEOD, *Chairman.*

GEO. BONAR.

R. W. CARLYLE.

GEORGE MALCOLM.

S. E. CHANDLER, *Acting Secretary.*

May 18th, 1918.

APPENDICES

A.—STATISTICAL TABLES :

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C.—COPY OF THE REPORT OF THE COMMITTEE OF THE INDIAN JUTE MILLS ASSOCIATION ON THE SUBJECT OF TRADE AFTER THE WAR: TRANSMITTED TO THE SECRETARY OF THE DUNDEE CHAMBER OF COMMERCE ON SEPTEMBER 29TH, 1917.

APPENDIX A

TABLE I. AREA UNDER JUTE IN INDIA, 1911-17

	1911. Acres.	1912. Acres.	1913. Acres.	1914. Acres.	1915. Acres.	1916. Acres.	1917. Acres.
Total	3,106,400	2,970,500	2,911,000	3,358,700	2,375,900	2,792,700	2,729,700
PROVINCES:							
Bengal	2,737,600	2,536,900	2,456,600	2,872,600	2,086,300	2,351,800	2,376,200
Bihar and Orissa	258,100	298,300	318,400	330,100	188,100	224,000	223,300
Assam	90,700	95,700	97,000	111,600	74,000	95,100	94,000
Cooch-Bihar State	20,000	39,600	39,000	44,400	27,500	31,800	36,200

No figures are available as to the area under jute in Nepal.

TABLE II. PRODUCTION OF RAW JUTE IN INDIA, 1911-17
(Round numbers)

	1911. Tons.	1912. Tons.	1913. Tons.	1914. Tons.	1915. Tons.	1916. Tons.	1917. Tons.
Total	1,470,500	1,757,600	1,588,000	1,865,000	1,312,000	1,483,000	1,579,000
PROVINCES:							
Bengal	1,294,000	1,553,000	1,418,000	1,662,000	1,162,000	1,327,000	1,493,000
Bihar and Orissa	126,000	142,000	107,000	124,000	109,000	98,000	120,000
Assam	43,000	40,500	41,000	55,000	28,000	46,000	39,000
Cooch-Bihar State	7,500	22,000	22,000	24,000	13,000	12,000	17,000

No estimate of the production of jute in Nepal is available. The imports of jute into India from Nepal for the period 1911 to 1916 were as follows:

	1911. Tons.	1912. Tons.	1913. Tons.	1914. Tons.	1915. Tons.	1916. Tons.
	10,178	17,142	18,750	6,607	16,428	12,500

Note : The above figures are taken from the annual *Estimates of Area and Yield of Principal Crops in India*, published by the Department of Statistics of the Government of India.

TABLE III. EXPORTS OF RAW JUTE FROM INDIA, 1911-12 TO 1916-17

QUANTITIES.							VALUES.						
	1911-12.	1912-13.	1913-14.	1914-15.	1915-16.	1916-17.		1911-12.	1912-13.	1913-14.	1914-15.	1915-16.	1916-17.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.		£	£	£	£	£	£
Total Exports . .	810,155	876,294	786,451	505,095	600,113	539,768		15,037,734	18,033,782	20,550,929	8,606,802	10,428,024	10,858,736
To COUNTRIES OF THE BRITISH EMPIRE :													
United Kingdom . .	345,762	340,673	290,369	265,580	338,661	260,227		6,530,513	7,352,171	7,826,358	4,495,943	6,152,744	5,472,900
Other . .	614	671	497	731	2,106 ²	1		12,062	11,719	14,823	13,513	35,958 ²	1
Total . .	346,376	341,344	290,866	266,311	340,767	1		6,542,575	7,363,890	7,841,181	4,509,456	6,188,702	1
To ALLIED COUNTRIES :													
Belgium . .	5,298	4,774	4,617	800	—	—		100,669	101,510	105,261	16,559	—	—
Brazil . .	1,318	4,071	3,594	1,350	8,991	13,192		25,983	104,657	102,590	22,424	176,718	287,884
France . .	68,413	86,204	72,708	34,195	29,639	44,837		1,288,463	1,844,225	2,045,092	571,027	579,998	984,327
Italy . .	32,032	42,254	37,770	41,506	60,740	38,451		603,609	921,216	1,138,327	746,309	1,117,613	834,160
Japan . .	3,959	4,652	3,703	3,218	4,635	4,207		72,399	97,729	109,868	56,159	71,656	79,344
Russia . .	6,971	8,776	9,086	4,357	3,285	11,765		136,023	195,378	266,500	87,807	65,942	252,265
United States . .	99,892	124,325	117,744	81,115	106,633	123,714		1,523,874	1,890,399	2,457,009	886,184	1,443,959	2,091,160
Total . .	217,883	275,656	249,222	166,541	213,923	236,166		3,751,020	5,155,114	6,224,647	2,386,529	3,455,886	4,529,140
To ENEMY COUNTRIES :													
Germany . .	170,688	180,149	158,380	30,031	—	—		3,390,571	3,820,361	4,499,111	880,918	—	—
Austria-Hungary . .	49,809	52,089	45,727	11,586	—	—		883,705	1,100,345	1,319,392	339,042	—	—
Total . .	220,497	232,238	204,107	41,617	—	—		4,274,276	4,920,706	5,818,503	1,219,960	—	—
To NEUTRAL COUNTRIES :													
Spain . .	23,206	25,706	21,181	25,133	39,533	37,693		427,571	566,135	584,461	387,157	687,400	739,731
Other . .	2,193 ²	1,350	3,075	5,493	5,890	1		42,292 ³	27,937	82,183	103,700	96,036	1
Total . .	25,399	27,056	24,256	30,626	45,423	1		469,863	594,072	666,644	490,857	783,436	1

¹ These figures cannot be stated, as the returns for 1916-17 (taken from the Monthly Accounts relating to the Sea-borne Trade and Navigation of British India) are not complete in detail.

² Including 444 tons, valued at £9,103, to Egypt.

³ Including 1,474 tons, valued at £28,569, to Egypt.

Note : The above figures 1911-12 to 1915-16 are taken from the Annual Statements of the Sea-borne Trade of British India.

TABLE IV
IMPORTS OF RAW JUTE INTO THE UNITED KINGDOM, 1911-17¹

	QUANTITIES.						VALUES.					
	1911.	1912.	1913.	1914.	1915.	1916.	1911.	1912.	1913.	1914.	1915.	1916.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	£	£	£	£	£	£
Total . . .	300,959	384,984	350,826	237,681	396,939	237,921	5,996,161	8,342,171	9,246,598	6,412,520	8,683,201	7,559,557
From :												
India . . .	297,847	381,802	347,548	234,764	395,010	234,006	5,943,882	8,285,163	9,182,226	6,346,602	8,638,503	7,453,409
China ² . . .	341	75	1,343	489	870	2,428	5,685	1,509	29,543	11,573	15,937	57,939
Other countries	2,771	3,107	1,935	2,428	1,059	1,487	46,594	55,499	34,829	54,345	28,761	48,209

¹ The imports of raw jute into the United Kingdom for the year 1917 amounted to 110,164 tons, valued at £4,380,476. Details of countries of origin are not yet available. (Monthly Accounts of the Trade and Navigation of the United Kingdom.)

² Jute imported from China is most probably the product of Abutilon Avicenne, and not of Corchorus sp. (true jute).

Note : The above figures (1911-16) are taken from the Annual Statement of the Trade of the United Kingdom with Foreign Countries and British Possessions.

TABLE V. IMPORTS OF JUTE AND JUTE TOW INTO GERMANY, 1910-13.

	QUANTITIES.				VALUES.			
	1910.	1911.	1912.	1913.	1910.	1911.	1912.	1913.
	<i>Metric tons.</i>	<i>Metric tons.</i>	<i>Metric tons.</i>	<i>Metric tons.</i>	£	£	£	£
Total	128,216	141,650	158,995	162,078	2,115,550	3,116,300	3,736,400	3,808,800
From :								
British India	127,644	140,550	157,895	158,456	2,106,150	3,092,100	3,710,550	} not available
Netherlands Indies	26	373	446	1,568	450	8,200	10,500	
Great Britain	214	420	248	1,129	3,500	9,250	5,850	
Austria-Hungary	63	116	137	—	1,050	2,600	3,250	

Note : The above figures are taken from *Statistik des Deutschen Reichs, Auswärtiger Handel*. It will be observed that the imports of jute into Germany from the United Kingdom are recorded as averaging only 600 tons (approx.) per annum for the years 1911 to 1913; whereas in Table VII the exports of raw jute from the United Kingdom to Germany are given as averaging 26,600 (approx.) per annum from 1911 to 1913. The explanation of this difference may be that the German returns refer to net imports into Germany of jute from the United Kingdom.

The exports of jute and jute tow from Germany were 5,866 metric tons in 1910, 6,775 tons in 1911, 7,899 tons in 1912 and 7,811 tons in 1913, chiefly to Russia.

TABLE VI. IMPORTS OF RAW JUTE INTO AUSTRIA-HUNGARY, 1910-13.

	QUANTITIES.				VALUES.			
	1910.	1911.	1912.	1913.	1910.	1911.	1912.	1913.
	<i>Metric tons.</i>	<i>Metric tons.</i>	<i>Metric tons.</i>	<i>Metric tons.</i>	£	£	£	£
Total	59,480	55,707	56,078	60,881	820,308	1,195,375	1,215,027	1,636,176
From :								
British India	49,754	53,921	55,281	59,108	808,512	1,157,046	1,197,759	1,588,522
Germany	713	1,521	777	1,332	11,592	32,634	16,826	35,800
Great Britain	10	265	20	417	164	5,695	442	11,217
Other countries	1	—	—	24	40	—	—	637

Exports of jute average less than 50 tons a year; those of jute tow and waste were 347 metric tons in 1910, 541 metric tons in 1911, 1,204 metric tons in 1912 and 2,101 metric tons in 1913, almost entirely to Germany.

Note : The above figures are taken from *Statistik des Auswärtigen Handels des Vertragszollgebietes des beiden Staaten der Osterr.-Ungar. Monarchie*.

TABLE VII. RE-EXPORTS OF RAW JUTE FROM THE UNITED KINGDOM, 1911-17¹

	QUANTITIES.						VALUES.					
	1911.	1912.	1913.	1914.	1915.	1916.	1911.	1912.	1913.	1914.	1915.	1916.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	£	£	£	£	£	£
Total	109,657	140,396	129,829	79,546	101,894	78,198	2,256,887	3,072,747	3,475,298	2,374,929	2,280,174	2,382,303
To:												
BRITISH POSSESSIONS	137	127	186	18	145	316	2,948	3,311	4,943	525	3,900	10,531
ALLIED COUNTRIES:												
Belgium	18,076	24,258	19,026	10,707	—	—	378,864	530,448	521,659	327,408	—	—
Brazil	3,205	3,860	4,236	3,508	5,865	3,445	73,221	99,948	123,193	118,486	158,670	114,412
France	27,427	41,300	44,820	23,809	62,921	52,958	555,921	885,895	1,209,594	664,637	1,409,690	1,600,246
Russia	4,783	4,129	3,485	3,658	1,459	—	103,621	106,621	110,620	133,164	33,206	—
United States	3,795	6,510	4,203	3,677	7,073	6,162	87,251	134,353	105,478	88,800	148,012	187,152
Total	57,286	80,057	75,770	45,359	77,309	62,565	1,198,878	1,757,265	2,070,544	1,332,495	1,749,578	1,901,810
ENEMY COUNTRIES:												
Germany	23,487	29,256	27,226	16,020	—	—	465,090	626,189	706,601	484,829	—	—
NEUTRAL COUNTRIES:												
Argentina	573	920	741	435	813	1,079	14,676	23,451	19,138	11,647	17,047	29,736
Mexico	5,793	5,548	5,560	2,194	379	511	114,254	109,216	135,504	64,768	7,557	14,817
Netherlands	14,390	13,828	11,857	8,533	11,481	2,063	285,810	306,825	310,877	268,864	234,539	78,964
Norway	1,125	1,133	1,367	290	684	27	23,269	23,159	35,756	9,690	12,787	753
Spain	5,131	7,517	5,071	3,721	6,316	5,478	112,319	175,834	153,410	104,086	143,120	180,834
Sweden	743	916	988	2,350	3,589	4,262	17,236	21,947	28,053	78,496	83,793	121,891
Other	992	1,094	1,063	626	1,178	1,297	22,407	25,550	28,472	19,529	27,853	42,967
Total	28,747	30,956	26,647	18,149	24,440	15,317	589,971	685,982	603,210	557,080	526,696	469,962

¹ There-exports of jute from the United Kingdom for 1917 amount to 28,009 tons, valued at £1,052,440. No details as to countries of destination are yet available. (Monthly Accounts of the Trade and Navigation of the United Kingdom.)

Note: The above figures (1911-16) are taken from the Annual Statement of the Trade of the United Kingdom with Foreign Countries and British Possessions.

TABLE VIII. MAXIMUM POSSIBLE CONSUMPTION OF JUTE IN THE WORLD'S JUTE MILLS (ESTIMATED 1913)

	<i>Bales.</i>
BRITISH EMPIRE (total)	6,470,000
India ¹	5,000,000
United Kingdom	1,470,000
ALLIED COUNTRIES (total)	1,924,000
Belgium	152,000
France	593,000
Italy	255,000
Russia	274,000
United States	650,000
NEUTRAL COUNTRIES (total)	391,000
Greece	5,000
Holland	40,000
Norway	10,000
South America	92,000
Spain	208,000
Sweden	36,000
ENEMY COUNTRIES (total)	1,252,000
Austria	366,000
Germany	886,000
TOTAL	10,037,000

¹ An additional 250,000 bales (approximately) are used for domestic consumption by the ryots.

APPENDIX B

SUMMARY OF EVIDENCE OF WITNESSES

First Witness.—As regards measures which should be taken to increase the production of jute in India, witness pointed out that the success of the jute trade depends on the relative cheapness of its manufactures as compared with other fabrics. Low-priced jute, however, does not appeal to the ryot, and witness considered that the line of action taken should be to increase the yield of the fibre per acre by educating the ryot in improved methods of cultivation and the use of better seed. The deterioration in the quality of the jute shipped during the past twenty years has been most marked. Witness considered that the amount of moisture added to the jute should be regulated. Such action would undoubtedly tend to minimise heart- and ship-damage, more particularly in the case of daissee jute.

With regard to the assorting of jute, witness stated that for many years his firm had packed its own marks, selected with a view to special requirements. There would appear to be ample choice of native marks to suit all users, but there are great variations in

the quality of a particular grade. The adoption of definite standards for the various grades would be a much more satisfactory system. It should be a criminal offence to pack below these standards, outside certain narrow limits. With such safeguards European and native-owned marks should then be equally reliable.

Witness referred to the proposals made in the past to regulate the operations of the Bhita Bazaar. Hitherto, no action has been taken in this matter, and he considered that the Government of India should again be approached on the question.

Witness expressed his opinion that the Empire monopoly of raw jute should be jealously guarded. He suggested the imposition of an export tax on raw jute shipped from India, with a rebate of 100 per cent. to users within the Empire. A rebate to our Allies for a period of years, at least, might be necessary.

He did not think the immediate result of such a tax would be a large addition to the existing number of spindles in Dundee, owing to the very high rate of wages and the heavy cost of plant. The established mills, however, would have more continuous work and, if the stability of the tax were assured, mill owners would probably build extensions. In his opinion the existing mills and machinery were undoubtedly capable of a larger consumption of raw jute.

Under the existing circumstances of foreign tariffs, witness considered the jute trade of Dundee as fully developed. With the removal or favourable modification of the tariffs, however, he saw no obstacle to the expansion of the Dundee trade. Labour would be obtainable if wages were attractive. He considered that unsteadiness on the part of the employees and certain Trade Union regulations are the factors which tend most to a reduction in the consumption of jute in Dundee.

Witness stated that no injury would result to the Dundee industry by the establishment of mills in other parts of the British Isles if the importation of Calcutta manufactures to the United Kingdom were prohibited. He considered that an expansion in the jute manufacturing industry in Calcutta would seriously interfere with the Dundee trade.

In the event of further important extensions of jute manufacturing in India, a revision of the Indian Factory Act, resulting in shortened hours of work and a minimum wage more in accordance with conditions obtaining in this country, would help to maintain and expand the Dundee industry. He considered that the increasing import of yarns into this country from the United States should be discouraged.

Referring to Bimlipatam jute, witness understood that the quality in recent years had improved. Formerly, he had regarded the fibre as too brittle; and the sand or mud adhering to the fibre had a detrimental effect upon the machinery. If these disabilities

were removed there is no reason why larger quantities of Bimlipatam jute should not be used, if available.

Second Witness.—Witness stated that there is frequently insufficient margin in the supplies of raw jute available, and considered that an increased production of jute in India would be an advantage to the trade, and tend to prevent serious fluctuation in price and abnormal speculation. He viewed with grave suspicion any restrictions imposed with the object of preventing such fluctuation and speculation, as calculated to interfere with legitimate business.

In point of quality, jute imported to-day is inferior to that received twenty years ago, a fact he attributed to imperfect preparation and to the presence of excessive moisture in the bale. Apart from this latter defect he regarded present methods of packing and assorting as fairly satisfactory, and while improvement in these respects would not be impossible under both European and native-owned marks, witness hesitated to suggest any changes that would interfere with the business of the balers, so long as the methods employed by them do not result in serious detriment to the spinners. He deplored the action of balers of repute in leasing a good mark to other balers, and considered that this practice should be prohibited.

Witness was strongly in favour of an export duty on all jute and cuttings exported from India, with a complete rebate to the United Kingdom. He was firmly of opinion that should the occasion arise, Dundee could and would cope with increased supplies of raw jute, either by additions to existing mills or the erection of new ones. Such expansion would be necessary, unless new methods of manufacture were introduced. He believed that the additional labour necessary would be forthcoming.

Witness did not consider that the jute trade of Dundee is fully developed, and was of the opinion that expansion will take place after the war. The relatively slow growth of the Dundee trade is to be attributed to legislation unfavourable to the manufacturer, and to the compulsory limitation of the working hours in the mills to fifty-five only per week.

In the opinion of witness, injury would result to the Dundee trade by the erection of jute mills in other parts of the United Kingdom. Similarly, an expansion of the jute manufacturing industry in Calcutta, if more than sufficient to meet the increased demand for goods expected to arise after the war, would also affect Dundee. Further, in the event of important developments in jute manufacture in India, it would become necessary for the Dundee trade to devote more attention to specialities (either for the home or export trade), the manufacture of which is not suited to the conditions at present obtaining in Calcutta.

As regards Bimlipatam jute, witness stated that large quantities of this fibre could be utilised in Dundee if shipped up to the high standard of quality obtaining in former years. Bimlipatam jute imported into this country in recent years has been poor in colour and very harsh, and has contained large quantities of mud and sand. An extended use of the fibre cannot be expected unless these defects are avoided.

Third Witness.—Witness offered no suggestion as to action which might be taken in India to increase the production of jute. As regards the quality and condition of the jute shipped, he considered that steps should be taken to abolish the pernicious practice of deliberately packing jute in a wet condition. Apart from the fraud involved, the excessive moisture results in deterioration of the fibre and, in many cases, heart-damage. He advocated setting up a standard of moisture content.

Witness was of the opinion that the number of marks and grades of jute is excessive, and that too much is left to the discretion of the individual baler in Calcutta as to what constitutes the correct standard of a particular mark or grade. He considered that the grading would be improved and greater regularity obtained by the adoption of standard samples of the several qualities, which balers would be expected to follow in making up specified marks and grades. The samples would be renewed periodically. He condemned the practice of leasing out marks, as between baler and baler.

It would be difficult to restrict fluctuations in the price of jute, but witness considered that legislative means should be taken to prevent the cornering of the crop.

Witness considered that the jute trade should be a close monopoly of the Empire, and believed that such could be attained by the adoption of approved fiscal methods. The Dundee industry is certainly not fully developed, and there are great possibilities of expansion. In his opinion the capital necessary to deal with increased supplies of raw jute would be forthcoming. The output of the existing plant in Dundee is capable of a small increase only. Witness considered that additional labour for the mills could be obtained if work were available and wages satisfactory. He looked for the wider adoption of machinery in place of certain forms of hand labour. Relatively, this would be of more benefit to Dundee than to Calcutta.

The comparatively small growth of the Dundee trade in recent years was attributed by witness to the large extensions in the Calcutta industry effected with Dundee capital. He believed, however, that probable legislation dealing with trade expansion in this country would assist in the extension of the Dundee jute trade, if judiciously applied.

Witness expressed his opinion that expansion of the Calcutta

manufacturing industry cannot be retarded by Dundee. The latter is in a position to manufacture classes of goods at present not feasible in the Calcutta mills, and the two industries will be best developed each along its own lines. In the event of further important extensions in the manufacturing industry in India, he considered that Dundee should be protected against the import of yarns under seven pounds per spindle, which are largely imported from the Continent. These yarns (which are not spun in Calcutta) could be much more extensively produced in Dundee.

As regards Bimlipatam jute, witness had spun it for the last twenty-five years, and regarded it as a useful fibre. This fibre could certainly be used in Dundee to a considerably larger extent than at present, but care should be taken to export it clean and free from the large quantities of fine mud which at present are packed with the fibre.

APPENDIX C

COPY OF THE REPORT OF THE COMMITTEE OF THE
INDIAN JUTE MILLS ASSOCIATION ON THE SUBJECT
OF TRADE AFTER THE WAR; TRANSMITTED TO THE
SECRETARY OF THE DUNDEE CHAMBER OF COM-
MERCE ON SEPTEMBER 29TH, 1917

INDIAN JUTE MILLS ASSOCIATION

*Report of the Committee of the Association on the subject of Trade
after the War*

1. IN considering the question of the commercial policy to be adopted after the war in respect of the jute trade, the Committee have had before them the letter No. 11900-C, dated Delhi, December 5th, 1916, from the Government of India to all local Governments, copies of which, and of the relative memoranda, form the enclosure to Bengal Chamber of Commerce Circular No. 65, dated January 30th, 1917.

2. In the letter quoted the Government of India point out that the question of the treatment of imports and exports raises the whole subject of preferential and protective tariffs. They do not, however, invite discussion as to the principles on which a tariff should be based. They think that for practical purposes the best method will be to proceed by examining the cases of certain specified items of trade, and in connection with each of these to consider how far, if at all, protective measures are called for in the economic interests of India, and how far any restrictive measures suggested on national grounds will conflict with those interests. The Govern-

ment also put the two following enquiries with reference to each of the specified items of trade of which jute is one, namely :

- (a) Whether the adoption of any special measures, such as the imposition of export duties, or the restriction of exports in any other way, is likely to tend to secure any material advantage either to India or to the British Empire as a whole ; for example, by enabling them to retain a larger share of profits arising out of industries connected with the commodities in question ;
- (b) If so, what form such measures should take, and what would be their probable effect.

3. Before proceeding to examine these two enquiries, it is advisable to define the position in regard to jute. And in this connection the Committee quote the following paragraph, from the jute memorandum attached to the Government of India letter, as being a brief and accurate summary of the leading features of the situation :

“ It need hardly be added that jute differs from practically all our other important exports in that India possesses a monopoly of supply. Until, therefore, a substitute is found which is capable of competing in price and quality with jute or until the use of alternative methods of carrying goods, such as handling in bulk, is greatly increased, it is difficult to see how India's favourable position in the supply of raw material can be adversely affected. During a certain period of the war, when the price of cotton was abnormally low and jute difficult to obtain, it is understood that there was a certain degree of substitution of cotton for jute bags in part of the United States of America and elsewhere ; but, given normal conditions, any considerable competition between cotton and jute in the manufacture of bags seems improbable. There is little information at present available on the substitutes for jute (e.g. textilose, paper fibre, etc.) employed in Germany since the outbreak of war, and what information there is has already been placed at the disposal of the Calcutta jute interests. It is, of course, for consideration how far any measures that may be taken as part of our post-bellum policy may either (a) lower the price of jute to the cultivator to an extent detrimental to the cultivation of the crop, or (b) raise the price in foreign markets to an extent which will render the danger of substitutes a real one.”

4. The jute interests of the United Kingdom have expressed the opinion that an export duty of £5 per ton would not interfere in any way with the carrying on of the jute trade, for the reason that no country is so situated in regard to soil, climate, water and labour as to be able to compete with India in the raising of jute.

They point out also that although during recent years, in ordinary trade conditions, prices have fluctuated between £12 and £36 per ton, the consumption has rapidly increased and no successfully competing fibre has been found. To this view of the situation the Committee cannot give unqualified acceptance. They admit that at the present time India possesses a monopoly of the supply of jute ; but they are bound to recognise that elsewhere there are produced several other fibres and materials which may eventually compete with jute in the manufacture of comparatively cheap packing and wrapping materials.

5. Various factors have contributed to the establishment of jute in the position that it now holds, chief among them being undoubtedly the cheap labour which has enabled the Bengali ryot so far to supply all demands for the raw material at rates sufficiently low to preclude competition. There is evidence, however, that the conditions which have favoured jute are gradually changing. The rapid expansion of the past few years has been possible only by the employment of outside labour ; and if the increase is to be continued it will necessitate further demands for labour, the cost of which is steadily increasing. Mr. Finlow, the Fibre Expert to the Governments of Bengal and Assam, has stated that "Every year large numbers of coolies migrate eastwards from the overcrowded districts of Bihar and the United Provinces, more especially to the jute-growing districts of northern Bengal. The supply of such labour, however, is not only limited, but it is expensive, and, through lack of experience, often inefficient. The result is an inevitable rise in the cost of production of jute as well as a deterioration in the quality of the fibre obtained." If the industrial development of India is to be speeded up in the near future, labour will become still scarcer and dearer ; and there is every likelihood of yet higher prices having to be paid to the ryots to induce them to go on increasing the area under jute.

6. The argument used, or implied, by the jute interests of the United Kingdom is that jute, being an absolute monopoly of India, and being also a commodity essential in the carrying trade of the world, an advance in price need not occasion any concern to producers and manufacturers. For the past history of the fibre shows, according to this view—that a great and permanent advance in price has failed to bring any competitive fibre into existence ; and that there is no reason to apprehend any different result from a still higher range of prices. There is of course much to be said for this argument, but the Committee do not find it to be altogether convincing. They take the view that there must be a limit to the price, and that when that limit has been reached competitive substitutes will come into use. In other words, they do not consider the monopoly to be absolute, but conditional, the condition being the

price. They would not therefore make an absolute increase in the price in markets outside India, as the proposed duty would do, more especially as prices in India are, as they have shown, rising from unavoidable causes. They would make the artificial increase conditional, the condition being the range of taxation levied by the importing country on jute goods manufactured within the British Empire.

7. Heavy taxation is levied by most countries—not even excepting British Possessions—upon jute manufactured goods, while these same countries admit raw jute free. Some of them also differentiate between cloth and bags; and by imposing high duties on the latter they are building up bag-making industries which, in the absence of such duties, could not live against Indian competition. Until recent years far more bags than cloth were exported from India; but owing to these differential tariffs in consuming countries this is no longer the case. In these circumstances it would seem to be highly unreasonable, and quite unnecessary to give—without any return consideration—to certain of these countries a rebate on any export duty that may be imposed by India on raw jute. Yet this is apparently the proposal which is made by the jute interests of the United Kingdom. Surely a condition precedent to any such rebate should be a corresponding reduction in the import duties levied by any particular country on British-made jute goods. There should be no question of giving something for nothing. The export duty on raw jute ought not to be a merely arbitrary imposition. On the contrary, it should be levied in respect of each country on a scale in direct relation to the import duties levied by that country on jute goods. The greatest advantage attaching to such a duty would be that, if skilfully used, it would enable India to force down the duties levied by importing countries on British-made goods; and there is no reason why the jute industry should forego this advantage. So far as the enemy countries are concerned, special additional duties could be levied against them if such should be considered to be advisable.

8. It may be argued that the Indian manufacturer does not need any protection; and that the tendency to lower prices for his raw material which export duties may be expected to bring about is of no great importance to him. It is of course true that the Indian mills have found ready markets for their goods, and that the industry has developed as rapidly here as could be expected, in view of the difficulty of securing the necessary machinery and of training the required labour. But it must not be forgotten that the jute industry of the United Kingdom has not maintained its position in comparison with foreign countries. During the ten years ended March 31st, 1897, the United Kingdom took over 80 per cent. of the exports of raw jute from India, and during the decennium 1900–1909

she took only 40 per cent. of the exports. These are significant figures. They mean that the increasing exports of free jute to those foreign countries that have protected their manufactures against competition have prevented any material expansion of the industry in the United Kingdom during the past forty years, so far at least as the weight of raw material consumed is concerned. One of the principal markets lost to the United Kingdom is that of Germany. Under the trade conditions prevailing before the war there was nothing to prevent other countries following the example, set by Germany, of taking their raw material duty free from India, and converting it into the manufactured article—for at least internal consumption—under the protection of high import duties. And what has been said above with reference to the bag-making industry of foreign countries shows that the German example was being followed. It seems therefore to the Committee to be essential that both India and the United Kingdom should protect themselves against discriminating tariffs in other countries. But they fail to see how this protection would be afforded by a simple export duty, which would be remitted in whole or in part to certain countries, quite irrespective of whether such countries do, or do not, tax British-made goods.

9. It must not be supposed that the Committee are not fully alive to the difficulties of exporting jute subject to differential export duties. But similar difficulties would arise under the rebate system, whereby discrimination would be exercised as between the British Empire, the Allies, the neutrals and the enemy powers. It has, however, to be remembered in this connection that obstacles which appear formidable when viewed in the light of pre-war knowledge and experience are seen now to be no longer insurmountable. Already Government machinery has been created to control exports and to regulate their use. Jute and jute goods are now sold in Allied and neutral countries subject to the condition that the purchaser will not export them, except as the British Government may from time to time permit ; and that he will re-sell only to those who will accept and hold the merchandise on the same conditions. Restrictions on trade which are considered to be essential during the war may not of course be possible or advisable afterwards. But there seems to be no reason why the special measures now in force for the protection of British trade should not be continued during the reconstruction period, or until such time as they are adapted to the permanent policy of the Empire. By means of these measures and of appropriate export duties it would be possible to retaliate effectively against foreign countries imposing duties on jute or jute goods. There are already in existence export duties which could be adjusted as required, keeping in view the desirability of reducing to the lowest possible limit those on jute goods, and at the same

time increasing those on raw jute to the extent necessary to protect the manufactures and interests of the Empire.

10. The Committee submit these notes after careful enquiry and consideration, during which they have had the opportunity of discussing the whole question with the Chairman of the other Associations interested in the jute trade. Their conclusions, from which their replies to the two enquiries specified in paragraph 2 will be apparent, may be summarised as follows :

- (a) That jute is not an absolute monopoly of India, but a conditional monopoly, the chief condition being the price.
- (b) That the possibility of substitutes being found, and of other methods of carrying goods being introduced, cannot be prudently ignored ; and
- (c) That advantage should be taken of the measures, and export duties imposed during the war, to create machinery which would be available for use against those countries which protect themselves against the jute manufactures of India, or of any other part of the British Empire.

The following tables accompanying the above report are not here appended :

- 1. " Colonial Import Duties, 1915 : Jute Goods."
- 2. " Tables showing Exports from India since 1867-68 of Jute Raw and Manufactured."
- 3. " Foreign Import Duties, 1913 : Jute and Jute Goods."

REPORTS ON SILK

I

INDIAN SILK

THE Advisory Committee of the Imperial Institute on Silk Production has, as requested, carefully considered the question of the prospects of an increased utilisation of Indian silk within the British Empire. In dealing with this question it has been necessary for the Committee to take into consideration the present position of the silk industry in India, since an improvement in the export trade in Indian silks must depend in large part upon the organisation and development of sericulture in India.

The most recent survey of the Indian silk industry is that carried out by Professor H. M. Lefroy on behalf of the Government of India in 1915-16. Further, an investigation into the Utilisation of Indian Silks in Great Britain and France has recently been made by Mr. R. C. Rawlley, M.A., under the auspices of the India Office.

Through the courtesy of the India Office the Committee has been furnished with a copy of Professor Lefroy's report, which has been printed in India, and also with an advance copy of Mr. Rawlley's report. The information contained in these reports has been of great assistance to the Committee.

PRELIMINARY STATEMENT

The position of India among the silk-producing countries of the world is unduly low. Her natural advantages are not fully utilised in silk production, with the result that, at the present time, the industry is not able to meet local demands. A large quantity (over 2,000,000 lb.) of raw silk is annually imported, chiefly from China and Hong Kong, in addition to waste silks mainly from Japan. There

is also a large import of silk yarns into India, chiefly from Japan and Italy.

Exact figures for the production of silk in India are not available, but the following approximate estimate has recently been made by Professor Lefroy :

	Green cocoons.	Raw silk.
	lb.	lb.
Mysore . .	15,360,000	1,152,000
Madras . .	5,000,000	400,000
Bengal . .	8,000,000	500,000
Assam . .	—	12,000
Burma . .	—	15,000
Kashmir . .	2,640,000	96,000
Punjab . .	12,000	1,800
	<u>31,012,000</u>	<u>2,276,800</u>

In the table on p. 35 an estimate is given of the world's production and consumption of raw silk (*soie grège*) in 1913. The statistics of production are quoted on the authority of *Statistique de la Production de la Soie en France et l'Etranger* (published under the authority of the Syndicat de l'Union des Marchands de Soie de Lyon); the figures of consumption are from the *Bulletin des Soies et Soieries* and other reliable sources.

It will be observed that Japan has become the leading silk-producing country of the world. In recent years the Japanese have taken active measures to advance the sericultural industry of the country, and the striking success achieved is well shown in the following figures of exports of raw silk since 1890 :

	Quantity.	Value.		Quantity.	Value.
	lb.	£		lb.	£
1890 .	2,791,530	1,414,773	1912 .	22,627,269	15,345,268
1895 .	7,686,630	4,886,321	1913 .	26,762,967	19,285,265
1900 .	6,126,813	4,558,735	1914 .	22,688,127	16,516,820
1905 .	9,581,166	7,334,975	1915 .	23,567,922	15,519,781
1910 .	19,641,258	13,355,868	1916 .	28,764,666	27,259,987
1911 .	19,125,288	13,155,989	1917 .	34,171,747	36,255,409

(The above figures are taken from the official Statistical Abstracts for Foreign Countries.)

China stands next, followed by Italy, Turkey, Russia and France. The contribution of the British Empire is very small, and India is the largest producer. It is a matter of importance therefore to consider the present position of sericulture in India with a view to ascertaining

*Estimate of the World's Production and Consumption of Raw Silk (Soie Grège)
in 1913.*

Production. lb.	Country.	Consumption. lb.
BRITISH EMPIRE		
	Great Britain	1,236,280
249,052 ¹	India	1,630,960 ²
35,264	Egypt and Cyprus	11,020
<u>284,316</u>	Total	<u>2,898,260</u>
ALLIED COUNTRIES		
771,400	France	8,974,688
7,802,160	Italy	2,644,800
1,344,440	Russia and Caucasus, including Turkestan	3,768,840
407,740	Greece, Salonica and Crete	55,100
77,140	Serbia and Roumania	33,060
—	United States	26,965,940
12,706,060 ¹	China (Shanghai)	—
6,061,000 ¹	China (Canton)	—
26,712,480 ¹	Japan	—
26,448 ¹	Tonkin	—
<u>55,908,868</u>	Total	<u>42,442,428</u>
NEUTRAL COUNTRIES		
—	Switzerland	4,090,624
180,728	Spain	335,008
462,840	Persia	—
—	North Africa and various countries	1,013,840
<u>643,568</u>	Total	<u>5,439,472</u>
ENEMY COUNTRIES		
—	Germany	7,855,056
601,692	Austria-Hungary	1,586,880
220,400	Bulgaria	55,100
187,342	Turkey-in-Europe (Adrianople)	551,000
2,367,096	Turkey-in-Asia (Broussa and Syria)	—
<u>3,376,530</u>	Total	<u>10,048,036</u>
284,316	BRITISH EMPIRE (total)	2,897,260
55,908,868	ALLIED COUNTRIES (total)	42,442,428
543,568	NEUTRAL COUNTRIES (total)	5,439,472
<u>3,376,530</u>	ENEMY COUNTRIES (total)	<u>10,048,036</u>
<u>60,213,282</u>	Grand Total	<u>60,828,196</u>

¹ Export figures only. The internal consumption of China, Canton, Japan and Tonkin is enormous, but no figures are obtainable.

² Estimates of consumption of raw silk in India vary greatly. According to Lefroy, about 800,000 lb. per annum of locally produced silk were consumed in India in 1909-11, to which must be added the net import of raw silk into India. In 1913-14 the net import amounted to 2,542,349 lb.

the prospects of increasing the production of silk in a country recognised as possessing in a high degree natural advantages which, if combined with effective organisation of the industry, should enable it to become one of the leading silk-producing countries.

SILK IN INDIA

The principal silk-producing areas in India at the present time are Mysore, Bengal, Madras, Kashmir (including Jammu), Burma and Assam. Small quantities of silk are also raised in Patiala and the Punjab. Four varieties of the silk-worm are concerned. The most important is the domesticated mulberry worm (*Bombyx mori*), of which there are two races, viz. the univoltine worms grown in Kashmir and the Punjab from French and Italian seed, and the multivoltine worms raised in Bengal, Mysore, Assam and Burma. Professor Lefroy reports that the product of the French seed is superior in quality to that of the multivoltine races of Mysore and Bengal, of which, however, the output at present is considerably greater. The three remaining silk-worms of interest are wild, viz. (a) Tasar (*Antheraea paphia*), found chiefly in Chota Nagpur, the Central Provinces, Bengal and the United Provinces; (b) Muga (*Antheraea assama*), found only in Assam; (c) Eri (*Attacus ricini*), feeding on the castor-oil plant and found chiefly in Assam.

The Mysore industry is of considerable importance. The total annual production is estimated by Lefroy at about 1,152,000 lb. of raw silk and 1,000,000 lb. of waste silk. The raw silk is used by local weavers and also extensively in Madras. The waste from the reeling, which is stated to be of poor quality, is exported to Europe. Climatically, the Mysore State is regarded by Lefroy as the most suitable district in India for multivoltine silk culture; and, with the adoption of measures for its improvement, there would appear to be scope for a large extension of the industry, which has received much attention from the State during recent years.

The production of silk in Bengal has decreased during the last fifty years, and the area under mulberry is much less than formerly. The decline in the industry has been

attributed to (a) the fall in prices for the raw silk prior to the war ; (b) excessive rent charges for mulberry lands ; (c) degeneration and disease of the worms ; (d) competition of other crops. An important factor in the situation has been the withdrawal of European firms from the trade in recent years. Formerly these firms bought the cocoons, reeled the silk in filatures, and exported the raw silk and waste. With the fall in price for the raw silk, the prices offered by the firms for cocoons did not attract sufficient supplies to keep the filatures employed, and the majority have been closed down.

The export trade is now limited to a very small number of European firms. Bengal silk is still largely used in India, but is being replaced by imported silk of low grades. Further, for the maintenance and development of an export trade it is essential that stocks of filature-reeled silk of a definite grade should be available in sufficient quantity to meet a regular demand, and there is evidence that with increased efforts the Bengal silk industry should be able to meet the demands of the export market. Valuable work in regard to sericulture has been carried out by the Bengal Silk Committee, but much remains to be done.

In *Kashmir* the silk industry is conducted on modern lines and is now one of the leading industries of the State. During the last twenty years there has been a remarkable change both in the methods employed and in the output of raw silk, which is regarded in this country as of good quality. The industry is directed by an experienced officer under the control of the State.

Reeling is done in large filatures. The reeled silk is collected and sorted out into different qualities, the skeins after examination being packed into bales (164 lb. net) marked No. 1 or No. 2. The filatures are divided into sections, each of which is responsible for a production of waste silk based on the weight of cocoons issued. The reeled silk and the waste are exported to Europe and find a good market. The production of cocoons has nearly reached the limit of the mulberry available, and it has become necessary to increase the number of trees. The production of raw silk in 1915-16 was 169,921 lb., while the exports to Europe of No. 1 silk in 1915-16 were 569

bales (93,316 lb.), and of waste 123 bales of 246 lb. each (= 30,258 lb.).

In *Jammu* sericulture was commenced in 1909 on lines similar to those obtaining in Kashmir. In 1915 the crop amounted to about 3,000 maunds (246,900 lb.) of green cocoons. The industry is now regarded as a settled one, and will probably increase up to the limit of the available rearers and of the supplies of mulberry. The cocoons are filature-reeled, and the raw silk sold in Europe as part of the Kashmir output.

The silk industry of the *Punjab* is small, but progress has been made in recent years. At the present time between 500 oz. and 600 oz. of French seed are issued annually, and it is stated that this quantity could be easily increased if the supplies of mulberry were greater. The production of raw silk is estimated at about 1,800 lb. per annum. According to Lefroy, development of the industry depends upon the planting of adequate supplies of mulberry and the stimulation of interest in sericulture. The silk obtained is of uniform quality and is stated to reel well into a thread of fine size (e.g. 10/12, 11/13 denier).

In *Assam* more attention is paid to Eri silk than to mulberry silk, which is grown on a small scale as a subsidiary industry for local consumption. Owing to questions of caste, and other difficulties, the development of the industry appears uncertain. The total production of mulberry silk in the province has been estimated at 150 maunds (12,345 lb.) per annum.

Sericulture in *Burma* has greatly declined chiefly owing to the competition of large imports of raw silk superior in quality to the local product. The industry is small and scattered, and for religious, economic and climatic reasons there would appear to be little prospect of any considerable extension. The Burmese silk-worm, which is referred to as *Bombyx arracanensis*, is a multivoltine giving white and yellow cocoons. The methods of culture and reeling are primitive and unfavourably affect the quality of the silk. The production of raw silk is estimated by Lefroy at about 15,000 lb. per annum. It is all used locally.

Within recent years considerable progress has attended the establishment of a sericultural industry in *Patiala*.

The industry is in charge of an Indian Director of Sericulture who has graduated at the School of Sericulture at Montpellier. The Committee have had an opportunity of examining samples of the silk, which has been favourably reported on by experts in this country.

It is well known that for many years the mulberry silk industry in India has been steadily declining from its former important position. Attempts have been made from time to time to revive the industry, but no tangible results have been obtained except in Kashmir and Mysore. In the absence of definite figures it is not possible to afford reliable statistical evidence of the decline in production, but the position of the industry is reflected in the returns of exports and imports of raw silk for a period of years as shown in Tables I and II of the Appendix.

As regards exports of raw silk (Table I) it will be observed that the maximum exports (777,654 lb.) occurred in 1906-7, the amount steadily falling to 382,081 lb. in 1912-13. On entering the war period there was a sharp decline to 160,222 lb. in 1913-14 and a further drop to 82,712 lb. in 1914-15. The years 1915-16 and 1916-17, however, showed a marked recovery to 125,166 lb. and 218,636 lb. respectively, probably owing to the high prices then ruling. Exports of cocoons over the same period show much irregularity. A steady improvement occurred between the years 1908-9 and 1912-13, exports for the latter year (352,617 lb.) being the highest in the pre-war period. The amount, however, was surpassed in 1916-17 when over 526,000 lb. of cocoons were exported.

Considerable irregularity has also occurred in the exports of waste silk (chasm), but in 1915-16 and 1916-17 there was a marked improvement on the export for 1914-15 (347,754 lb.), which was the lowest recorded.

The position as regards exports of raw silk, however, is even less satisfactory than would appear at first sight, since the development of the Kashmir industry has played an important part in maintaining the exports at the figures quoted. Deducting the Kashmir output, the decline in the exports of raw silk from other parts of India would have been more marked.

On the other hand, imports of raw silk into India as compared for the decennial periods 1879-80 to 1888-89 and 1904-5 to 1913-14, show an increase of 5.6 per cent., but during the same periods the imports of silk manufactures (chiefly piece goods) have practically doubled. The fact that at the present time India needs to import annually over 2,000,000 lb. of raw silk indicates the desirability of increasing the local production of the material.

In Table III are given the relative amounts of mulberry and wild silks exported from India during the last ten years. Mulberry silk is by far the more important, but the relatively large export of chasam derived from wild silks is of interest, as is also the considerable export of wild cocoons.

The destinations of the Indian exports of raw silk, waste and cocoons, for the corresponding period are stated in Table IV. It will be observed that France takes by far the greater part of the raw silk and that the exports to the British Empire (nearly all to the United Kingdom) decreased from 190,000 lb. in 1908-9 to 47,000 lb. in 1909-10, subsequent years showing a further decline, from which the recovery since 1914-15 has been but slight and irregular. The raw silk lost to the United Kingdom appears to have been diverted to France in view of the relatively increased imports into that country since 1908-9.

As regards chasam (waste), France is also the most important customer, but since 1909-10 (when over 1,000,000 lb. was sent to France), there has been a marked decline, from which there was a partial recovery in 1916-17. On the other hand, exports to the United Kingdom more than doubled in the two years 1908-9 and 1909-10 (139,600 lb. and 331,600 lb. respectively), and the figures declined but slowly down to the outbreak of war.

By far the greater proportion of the cocoons exported is sent to France. A remarkable rise in the exports to that country is recorded for 1910-11 (134,000 lb. as compared with 7,900 lb. for the previous year), and apart from the years 1913-14 and 1914-15 there has been a steady growth in the exports. It will be noticed that the export of cocoons to the United Kingdom is relatively small, but shows no great variation. All the cocoons are re-exported from the United Kingdom, as no reeling is done in this country.

Tables V and VI have been compiled from official returns to show the origin of shipments of raw silk, chasam and cocoons from India. It may be observed, however, that the geographical areas referred to in the tables do not necessarily indicate the district of origin of the silk itself. For example, the material returned as exported from Bombay is probably in the main derived from the United Provinces and the Punjab ; while that exported from Sind is no doubt derived chiefly from Kashmir.

The tables indicate the relative importance of the exports from Bengal, Sind (Kashmir silk) and Madras. Bengal and Sind stand first in regard to exports of raw silk, the growth of the Sind exports (Kashmir silk) being very marked in contrast with the decline in those from Bengal. Chasam is derived mainly from Bengal and Madras, though large quantities were being exported from Sind previous to the war. Cocoons are exported mainly from Bengal, Bombay (probably from the Punjab and the United Provinces, etc.) and Sind (from Kashmir). The important growth of the latter export in the years immediately preceding the war is of interest.

The decline in the silk industry has been attributed to a variety of causes, the most prominent being the deterioration of the Bengal cocoon, bad reeling (except in Kashmir and Patiala), and the expansion and improvement of sericulture in Japan. Professor Lefroy also assigns other causes to this decline. Lack of organisation and want of capital have had serious effects on the development of the industry, which has also suffered from the competition of more profitable crops. Further, the prevalence of disease, and widespread ignorance regarding the modern development in sericultural methods are important factors in the situation.

The situation has long been familiar to members of the Committee. They recognise that the problem is not merely a sericultural one, but also largely an industrial and economic question. The Committee are strongly of opinion that for the development of the industry, and especially of the export trade, adequate financial provision, by a responsible body receiving Government support, is a necessity, as is also European supervision of the industry.

Modern filatures controlled by European directors, and

receiving support from the State, should be established in the chief silk districts. These filatures would purchase the cocoons and regulate the methods of production. They would also reel the small quantities of silk produced in other parts of India.

The proposed filatures would also grade the silk before export. The Committee further suggest that Silk Conditioning Houses should be established on the lines of that at Lyons, and that all raw silk should be officially examined and marked at a Conditioning House before leaving India.

As regards the sericultural aspects of the question, the Committee believe that it is of primary importance that efforts should be made to ascertain the races of worms best suited to individual localities, and to ensure that in the areas concerned the selected races shall be used exclusively.

In close relation to this question is that of disease among the worms. The Committee suggest that this matter should receive full expert attention, and that the provision of facilities for the issue of disease-free seed should be regarded as a cardinal point in any scheme adopted for the improvement of the industry.

They also consider that enquiries into the best leaf-producing races of mulberry for individual districts should be carried out, and the diseases of the mulberry and best methods of combating them fully investigated.

For the investigation of such questions the Committee consider that the establishment of a central Sericultural Institute, for research and training, on the lines of that at Montpellier, is a necessity. The functions of the proposed Institute should include :

- (a) The training of men to develop sericulture in India ;
- (b) The supply of disease-free seed of approved native and foreign races of worms ;
- (c) The testing of new races, and the production of hybrid races ;
- (d) Investigation of silk-worm and mulberry diseases ;
- (e) The study and demonstration of modern reeling and re-reeling processes with a view to their adoption in India.

In addition to the Central Institute, the Committee anticipate that valuable results would be obtained from

the establishment of smaller institutions in all important sericultural districts.

In regard to new races of worms, the Committee desire to mention that the cost of reeling multivoltine silk is higher than for Italian and Japanese univoltines, since the former spins a finer brin and bave, and the cocoon yields only about half the length of thread of the latter. Improved multivoltine races may result in a better and more robust cocoon, and with modern reeling appliances such silks may approach the standard of the perfect winding silks of Canton, which are also multivoltine. The Indian multivoltine silks are of distinct interest for manufacturers in this country and in France, especially if the reeling is improved. The silks exported during the last few years are inferior to the Watson's Surdahs of fifteen to twenty years ago.

If foreign seed is imported into India, the Committee consider that white races should be used if possible, since, other things being equal, light-coloured silks are preferred in this country.

INDIAN MULBERRY SILK IN ITS RELATION TO THE REQUIREMENTS OF THE BRITISH MARKET

In dealing with this question the Committee have had before them the information furnished by the Report of Mr. R. C. Rawlley on the Utilisation of Indian Silk in Great Britain and France, and they desire to make acknowledgments to the author of that report for the assistance thereby afforded to them.

In the first place it may be pointed out that in the world's markets, no less than in India itself, Indian silk encounters, and will continue to encounter, the competition of increasing supplies of fine quality silk from the Far East, notably from Japan. It is a matter for consideration, therefore, as to how far Indian silk is likely to meet this competition successfully, more especially in view of the fall in prices of raw silk prior to the war, which has been held to be one of the causes of the decline in the Indian silk industry. The Committee believe that a radical improvement in the quality of Indian silk will do much to render the situation

secure. They are of opinion that the enhanced value of the silk that would result from the use of carefully selected seed, the cultivation of approved varieties of mulberry, improved methods of rearing the worms and of reeling the silk, should render it possible for Indian silk to compete successfully with the Japanese and Chinese products.

The question of the suitability of Indian silks for the English market may be dealt with by considering the main branches of the silk industry and by defining the requirements of each. The most important branch is the broad silks trade, dealing with *crêpe-de-chine*, *crepoline*, *georgette* and other plain silks. For this branch of the industry silks which are full of "bone" are required. Evenness of size is necessary to ensure regular effects in the finished article.

In this trade, generally, white "raws" are preferred to yellow, owing to the large range of lighter shades needed. The most suitable sizes are 13/15 and 18/20 deniers. Bengal silks, being very soft and spongy, are quite unsuitable for this branch of the industry, but Kashmir and Patiala silks, if slightly improved in uniformity of size and in cleanliness, would find a ready market in this country. The Kashmir industry, acting under the guidance of their official brokers (Messrs. Durant, Bevan & Co., Ltd.), is already reeling the most useful sizes. The Committee suggest that the industry should be advised to increase the production of 13/15 to 18/20 deniers in order to develop further the consumption of Kashmir silks in the English markets.

In Leek, however, considerable quantities of 20/24, 24/28 and 26/30 deniers are used for knitted goods, and it is possible that coarser sizes of a good quality of Kashmir silk could be introduced with advantage in the place of Chinas of a similar size.

In the manufacture of mourning *crêpes*, etc., No. 1 Canton filatures are largely used at present, in place of Bengal silks formerly employed, which were discarded on account of defective reeling. Small quantities of Bengal rose filatures are, however, sometimes used for these purposes, and the Committee believe that there is still a possibility of re-establishing Bengal silks in this trade if the reeling were improved and supplies and prices were

satisfactory. Even with the present quality of Bengal silk, the Leek sewing silk industry and the silk cord and trimmings industry of Derby could utilise large quantities of this class of silk if available.

Coupled with sewing silks is the manufacture of knitting, lace and embroidery silks. Cantons are largely used at present for these purposes, and there should be a considerable field for Bengals in these trades.

Bengal silks are especially adapted to the requirements of the Leek industry on account of their pliability and good dyeing qualities with black and unweighted dyes. Further, in these trades, colour is not of primary importance. The Committee understand that about 95 per cent. of the trade could be done with yellow silk, as the bulk of sewing silks have to be dyed black, and yellow takes good black and the darker shades.

In order to compete with the supplies of raw silks from other countries, it is of the utmost importance to increase the production of a good class of raw silk in India and to reduce the production of inferior grades to a minimum. For this reason silks from Kashmir and Patiala should find a ready market in this country, but this does not imply that Bengals will be rejected altogether. There will always be a market for these latter silks, but the opportunities for sale would be greatly increased if the quality were improved.

The Committee regard the Kashmir silks as of great interest. Efforts should be made to increase the output, and if possible to return to the quality which was being produced prior to (say) 1907. The silk now imported is not so "nervy" as formerly, though rather lighter in colour. There would be a still greater demand for Kashmir silk if this defect were remedied and the winding qualities improved up to the standard of Italian and Japanese silks.

WASTE SILK

The requirements of the spinning industry are of decided importance in this country. In former years spinners used large quantities of Bengal waste; but at present, this class of waste has disappeared from the market. This fact is to be attributed to lack of supplies

from India, and also to the unsuitability of the Indian waste for the English market.

English spinners are agreed that the presence of foreign matter such as cotton and other vegetable fibre, hard twisted silk threads, hairs, pieces of paper and mineral matter makes Indian waste practically unworkable. The initial fibre is of fine quality, but the presence of foreign matter so lowers the grade that the spinners lose confidence in its quality, and cannot utilise the waste to the best advantage. In his report Mr. Rawlley points out that the loss on degumming in Bengal silks is not excessive, and compares favourably with the waste silks of China and Japan. It is therefore of great importance that all extraneous matter should be removed in India before shipment, so that consignments may reach this country free from defects and properly graded into different qualities.

The Committee believe that these defects can be remedied with proper organisation and more care on the part of exporters. If improvements in regard to cleaning, grading and packing were adopted by exporters, there is little doubt that the objection to Indian waste would be in large part removed.

Kashmir knubs and waste have been highly appreciated by spinners in this country, and the Committee believe that if larger quantities were available, spinners would be willing to obtain their supplies from Kashmir. The Committee understand that very large quantities of waste silk are available in India, and it is not apparent what becomes of the large portion at present unaccounted for in available returns of production and export.

It has been suggested that the degumming of the waste silk should be carried out in India, but authorities in England are unanimous that this is undesirable.

WILD SILKS

The three principal varieties of wild silk-worms in India are :

1. *Tasar (Antheraea paphia)*, occurring chiefly in Chota Nagpur, the Central Provinces, Bengal and the United Provinces. It is estimated that about 250,000 kahans (320,000,000) of cocoons are produced annually,

but statistics are difficult to obtain. Much of the silk produced is woven into cloth worn locally. Small quantities are exported to Europe for spinning or for manufacture into plush, but this silk is not commercially attractive in this country owing to the coarseness of the fibre and the difficulty of dyeing it in many useful colours.

2. Muga (*Antheraea assama*), grown in Assam. The worm is semi-domesticated, and the rearing is carried out on various trees. Muga silk is lustrous, and owes its value chiefly to its attractive colour. The silk is practically unknown in Europe, and in default of any records of experiments on a commercial scale, it is impossible at present to estimate the value of its development for European use. It might be useful to send over consignments for trial if obtainable on a reasonable basis, not exceeding, at any rate, the value of Eri silk.

3. Eri (*Attacus ricini*), a domesticated multivoltine worm feeding on the castor-oil plant. The silk is inferior to mulberry silk in lustre, colour and tensile strength, but is more "nervy" and resilient and is very suitable for the finer qualities of plush and for tropical shirtings and suitings. The chief commercial source is Assam, where it is hand spun and woven, and worn by natives, the surplus cocoons being disposed of to the Bombay silk mills, or exported to Europe (chiefly Switzerland) via Calcutta. Supplies are obtained mainly from the northern and southern districts of the Brahmaputra valley. In the former, the bulk of the silk is sold either as thread or cloth, while the southern districts produce nearly all the cocoons exported from Assam. The industry is carried on by agriculturists as a subsidiary home occupation.

The worm is tolerant of higher temperatures than the mulberry worm, thus rendering silk production possible in those districts not wholly suited to the latter insect. White and red-brown ("brown") cocoons occur. Mild bleaching agents might be used to remove the pigment of the latter, but the bleached cocoons would still be inferior in colour to the natural white cocoons, and the strength of the fibre would be liable to deterioration by the bleaching process. It would certainly therefore not be advisable to use this process in India before exporting.

The silk cannot be reeled from the cocoon, and is therefore only applicable to rough native hand spinning or to the European process of waste silk spinning. There is thus no object in killing the moths, which are allowed to escape, and certain native prejudices remain unaffected. The cocoons should be carefully sorted, and any excessive proportion of coloured or unpierced cocoons rejected previous to packing for export. Messrs. Lefroy & Ghosh both recommend the use of the "Coryton cocoon-reversing machine" for the elimination of worm debris from the cocoons, and others have recommended hand methods; but desirable as it is to secure purity of silk in cocoons, it is feared that the reversing process would prove too slow and laborious, and therefore too costly, to be used on a commercial scale.

No reliable figures of production are available; a rough estimate gives 5,325 maunds (438,247 lb.) of cocoons as raised in Assam annually. Previous to 1911-12 the maximum export of cocoons was 3,544 maunds (291,671 lb.) in 1889, followed by a steady decline to nil from 1898 onwards for several years. Exports in recent years are as follows :

	<i>Maunds.</i>	
1911-12	323	(26,583 lb.)
1912-13	1,081	(88,961 lb.)
1913-14	3,891	(320,229 lb.)
1914-15	643	(52,919 lb.)
1915-16	283	(23,291 lb.)
1916-17	857	(70,274 lb.)

The cocoons exported are sent to Gauhati, and thence to the silk mills of Bombay, or to Calcutta for shipment to Europe. The decline in exports (1913-16) is stated by Lefroy to be due to a fall in price.

Of these wild silks the Committee consider that Eri is the most likely to find an established position in this country, and suggest that, if feasible, the production of cocoons for exports should be encouraged. They desire, however, to direct attention to the fact that the condition in which the cocoons are shipped has hitherto hindered their more extended use. A rise in price of the cocoons from Rs. 72 (£4 16s.) per maund in 1911 to over Rs. 100 (£6 13s. 4d.) per maund in 1913, resulted in the addition of cocoons containing chrysalides to the cleaned cocoons.

Protests were made by Bombay and English spinners, but the practice has since been continued. Recently shipments have been found to contain an excess of unpierced cocoons (i.e. still containing "worm"), and also too large a proportion of red and other dark-coloured cocoons and small cocoons of poor quality.

The Committee are strongly of the opinion that steps should be taken by the Government of India to ensure that the bales exported contain clean, pierced cocoons, almost exclusively. A small percentage (not exceeding 10 per cent.) of unpierced cocoons would be permissible. They further advise that the cocoons should be exported in the reversed condition and suggest the use of the Coryton or a similar machine for the reversing process if found possible on a commercial scale and at a reasonable cost.

SUMMARY OF RECOMMENDATIONS

The principal conclusions and recommendations of the Committee may be summarised as follows :

As regards Economic and Industrial Questions

1. The development of the Indian silk industry, and especially of the export trade, is dependent upon its being adequately financed by a responsible body receiving Government support, and upon European supervision of the industry. (See p. 41.)

2. Indian silk encounters, and will continue to encounter the competition of increasing supplies of fine quality silk from the Far East, notably Japan. The Committee are of the opinion that the enhanced value of Indian silk that would result from a radical improvement in its quality and standard of reeling should render it possible for the Indian product to compete successfully with Japanese and Chinese silks. (See pp. 43, 44.)

It is of the utmost importance to increase the production of a good class of raw silk in India, and to reduce to a minimum the production of inferior grades. (See p. 45.)

3. Modern filatures, controlled by European directors and assisted by the Government, should be established in the chief silk districts. These filatures would regulate

the methods of production, purchase the cocoons, and grade the silk before export. They would also reel the small quantities of silk produced in other parts of India. (See pp. 41, 42.)

4. Silk Conditioning Houses, on the lines of that at Lyons, should be established, and all raw silk should be officially examined and marked at a Conditioning House before leaving India. (See p. 42.)

5. The Kashmir and Patiala silks, if slightly improved in uniformity of size, in cleanliness and nerve (Kashmir silk) should find a ready market in this country. The Kashmir industry should be advised to increase the production of 13/15 to 18/20 deniers in order to develop further the consumption of Kashmir silk in the English market. Coarser sizes, however, could be introduced with advantage to meet the needs of certain branches of the trade. (See pp. 44, 45.)

6. Large quantities of Bengal silk, if available, could be utilised for certain sections of the industry in this country, though an improvement in the quality is desirable. With improved reeling, and satisfactory prices, there would be a possibility of re-establishing this class of silk in its former position in other branches of the trade. (See pp. 44, 45.)

7. *Waste Silk.*

(a) The present objections to Indian waste silk in this country would be removed if adequate improvement were effected in regard to cleaning, grading and packing the material before shipment. (See p. 46.)

(b) Degumming of the waste should be carried out in this country. (See p. 46.)

(c) Kashmir knubs and waste could be used in larger quantities in this country if supplies were available. (See p. 46.)

8. *Wild Silks.*

(a) Of Indian wild silks Eri is the most likely to find an established position in this country, and if feasible the production of cocoons for export should be encouraged. It is essential, however, that steps should be taken by the Government

of India to ensure that the bales exported contain clean, pierced cocoons almost exclusively. Further, if feasible commercially, the cocoons should be exported in the reversed condition. (See p. 49.)

- (b) A consignment of Muga silk should be sent to the Committee for practical trial if the silk can be obtained at a price not exceeding that of Eri silk. (See p. 47.)

As regards Sericultural Questions

(9) The establishment, by the Government of India, of a Central Sericultural Institute is a necessity. The functions of the Institute should include :

- (a) The training of men to develop sericulture in India ;
- (b) The supply of disease-free seed of approved native and foreign races of worms ;
- (c) The testing of new races and the production of hybrid races ;
- (d) The investigation of silk-worm and mulberry diseases ;
- (e) The study and demonstration of modern reeling and re-reeling processes with a view to their adoption in India. (See p. 42.)

10. The establishment of smaller institutions in all important sericultural districts.

11. If foreign seed is imported into India, white races should be selected, if possible. (See p. 43.)

(Signed) FRANK WARNER, *Chairman*.

HENRY BIRCHENOUGH.

WYNDHAM R. DUNSTAN.

FRANK J. FARRELL.

WM. FROST.

J. SUGDEN SMITH.

RICHD. SNOW.

A. JOHN SOLLY.

H. SOLMAN.

WILLIAM STOKES.

WM. WATSON.

S. E. CHANDLER, *Secretary*.

August 14th, 1918.

APPENDIX

STATISTICAL TABLES

TABLE

- I. EXPORTS OF RAW SILK, WASTE AND COCOONS (INDIAN MERCHANDISE) FROM INDIA, 1879-80 TO 1916-17.
- II. IMPORTS OF RAW SILK AND SILK WASTE INTO INDIA, 1879-80 TO 1916-17.
- III. EXPORTS OF MULBERRY AND WILD SILK FROM INDIA, 1907-8 TO 1916-17.
- IV. DESTINATIONS OF EXPORTS OF RAW SILK, WASTE AND COCOONS FROM INDIA, 1907-8 TO 1916-17.
- V. EXPORTS OF SILK (UNMANUFACTURED) FROM INDIA, 1907-8 TO 1916-17. (TABLE SHOWING SHIPMENTS FROM DIFFERENT PROVINCES.)
- VI. EXPORTS OF RAW SILK, CHASAM AND COCOONS FROM INDIA, 1907-8 TO 1916-17. (TABLE SHOWING SHIPMENTS FROM DIFFERENT PROVINCES.)

TABLE I. EXPORTS OF RAW SILK, WASTE AND COCOONS (INDIAN MERCHANDISE) FROM INDIA, 1879-80 TO 1916-17¹

QUANTITIES (lb.):		1879-80.	1884-85.	1888-89.	1894-95.	1899-00.	1901-2.	1902-3.	1903-4.	1904-5.	1905-6.
Raw silk	.	563,210	531,205	593,425	510,800	722,286	727,651	681,852	624,064	506,318	578,450
Chasam (waste)	.	788,481	953,183	1,233,494	793,892	1,217,432	1,165,754	1,240,689	1,136,566	751,355	1,131,906
Cocoons .	.	49,815	82,713	262,843	26,035	none	42,356	67,281	101,686	85,990	68,906
						recorded					
Total .	.	1,401,506	1,567,101	2,089,762	1,330,727	1,939,718	1,935,761	1,989,822	1,862,316	1,343,663	1,779,316

VALUES (£):											
Raw silk	.	305,670	246,310	308,865	283,416	409,993	383,548	368,294	350,110	283,279	315,522
Chasam (waste)	.	35,365	57,144	90,239	49,923	55,747	56,663	64,410	65,998	42,730	56,204
Cocoons .	.	3,069	5,740	27,441	1,334	none	2,070	3,812	6,722	5,322	4,252
						recorded					
Total .	.	344,104	309,194	426,545	334,673	465,740	442,281	436,516	422,830	331,331	375,978

QUANTITIES (lb.):		1906-7.	1907-8.	1908-9.	1909-10.	1910-11.	1911-12.	1912-13.	1913-14.	1914-15.	1915-16.	1916-17.
Raw silk	.	777,654	730,733	581,566	501,135	494,035	381,677	382,081	160,222	82,712	125,166	218,636
Chasam (waste)	.	1,095,193	1,093,384	1,182,601	1,485,548	1,147,243	1,092,764	943,143	909,077	347,754	793,120	799,038
Cocoons .	.	70,591	119,009	69,387	88,929	209,273	275,505	352,617	133,799	85,816	344,517	526,429
Total .	.	1,943,438	1,943,126	1,833,644	2,075,612	1,859,551	1,749,946	1,677,841	1,203,098	516,282	1,262,803	1,544,103

VALUES (£):												
Raw silk	.	395,915	364,481	304,740	265,413	268,587	221,004	205,979	101,903	53,271	81,553	199,261
Chasam (waste)	.	57,180	52,642	51,149	67,055	57,625	63,408	46,766	51,752	19,983	38,411	49,593
Cocoons .	.	4,573	8,087	4,449	5,915	10,807	21,177	25,503	11,288	6,133	40,839	79,942
Total .	.	457,668	425,210	360,338	338,383	337,019	305,589	278,248	164,943	79,387	160,803	328,796

¹ Including wild silks.

Note: The above figures are taken from the Annual Statements of the Sea-borne Trade of British India.

TABLE II. IMPORTS OF RAW SILK AND SILK WASTE INTO INDIA, 1879-80 TO 1916-17

QUANTITIES (lb.):	1879-80.	1884-85.	1888-90.	1894-95.	1899-00.	1901-2.	1902-3.	1903-4.	1904-5.	1905-6.
Raw silk	2,005,020	1,831,702	2,360,467	2,493,614	1,694,848	2,128,483	1,639,189	1,544,315	1,858,709	1,645,696
Chasam (waste)	—	—	—	882	—	—	—	—	—	—
Total	2,005,020	1,831,702	2,360,467	2,494,496	1,694,848	2,128,483	1,639,189	1,544,315	1,858,709	1,645,696
VALUES (£):										
Raw silk	455,490	498,376	711,364	690,522	384,059	539,747	367,743	395,302	489,408	474,603
Chasam (waste)	—	—	—	500	—	—	—	—	—	—
Total	455,490	498,376	711,364	691,022	384,059	539,747	367,743	395,302	489,408	474,603
QUANTITIES (lb.):										
Raw silk	1,422,467	2,050,839	2,168,458	2,330,185	2,121,799	2,239,105	3,578,837	2,563,720	2,303,331	2,240,327
Chasam (waste)	—	—	—	—	—	—	104,875 ¹	79,072	134,741	30,267
Total	1,422,467	2,050,839	2,168,458	2,330,185	2,121,799	2,239,105	3,683,712	2,642,792	2,438,072	2,270,594
VALUES (£):										
Raw silk	378,685	654,342	679,226	651,312	568,187	706,494	1,142,974	839,309	755,697	719,532
Chasam (waste)	—	—	—	—	—	—	8,818 ¹	7,709	12,058	2,233
Total	378,685	654,342	679,226	651,312	568,187	706,494	1,151,792	847,018	767,755	721,765
										737,945

¹ Separately recorded from April 1912.

Note: The above figures are taken from the Annual Statements of the Sea-borne Trade of British India.

TABLE III. EXPORTS OF MULBERRY SILK AND WILD SILK FROM INDIA, 1907-8 TO 1916-17

QUANTITIES (lb.):		1907-8.	1908-9.	1909-10.	1910-11.	1911-12.	1912-13.	1913-14.	1914-15.	1915-16.	1916-17.
MULBERRY SILK:											
Raw	:	716,134	565,463	479,647	486,213	378,607	382,081	160,222	82,610	125,166	217,870
Chasam (waste)	:	747,892	552,755	922,929	787,087	708,933	605,442	626,676	238,362	475,646	415,379
Cocoons	:	54,284	33,835	40,717	157,998	207,202	275,671	71,123	44,046	310,119	446,533
Total Mulberry Silk	:	1,518,310	1,152,053	1,443,293	1,431,298	1,294,742	1,263,194	858,021	385,018	910,931	1,079,782
WILD SILK (Tasar, Muga, Eri and others):											
Raw	:	14,599	16,103	21,488	7,822	3,070	—	—	102	—	766
Chasam (waste)	:	345,492	629,936	562,619	366,156	383,831	337,701	282,401	89,392	317,474	383,659
Cocoons	:	64,725	35,552	48,212	51,275	68,303	76,946	62,676	41,770	34,398	79,896
Total Wild Silk	:	424,816	681,591	632,319	419,253	455,204	414,647	345,077	131,264	351,872	464,321
Total Silk	:	1,943,126	1,833,644	2,075,612	1,850,551	1,749,946	1,677,841	1,293,098	516,282	1,262,803	1,544,103
VALUES (£):											
MULBERRY SILK:											
Raw	:	360,918	300,838	250,248	266,691	220,262	205,979	101,903	53,248	81,553	198,750
Chasam (waste)	:	38,804	29,126	43,001	42,235	48,821	32,809	38,476	15,200	27,011	32,884
Cocoons	:	3,787	2,256	2,683	7,400	16,787	20,493	7,140	3,262	38,534	75,748
Total Mulberry Silk	:	403,509	332,220	305,932	316,386	285,870	259,281	147,519	71,710	147,098	307,382
WILD SILK (Tasar, Muga, Eri and others):											
Raw	:	3,563	3,902	5,165	1,896	742	—	—	23	—	511
Chasam (waste)	:	13,838	22,024	24,054	15,390	14,587	13,957	13,276	4,783	11,400	16,709
Cocoons	:	4,300	2,192	3,232	3,347	4,390	5,010	4,148	2,871	2,395	4,194
Total Wild Silk	:	21,701	28,118	32,451	20,633	19,719	18,967	17,424	7,677	13,795	21,414
Total Silk	:	425,210	360,338	338,383	337,019	305,589	278,248	164,943	79,387	160,893	328,796

Note: The above figures are taken from the Annual Statements of the Sea-borne Trade of British India.

TABLE IV. DESTINATIONS OF EXPORTS OF RAW SILK, WASTE AND COCOONS FROM INDIA, 1907-8 TO 1916-17

RAW SILK :	QUANTITIES (lb.):										
	1907-8.	1908-9.	1909-10.	1910-11.	1911-12.	1912-13.	1913-14.	1914-15.	1915-16.	1916-17.	
To United Kingdom .	219,712	189,483	46,872	58,049	22,105	11,214	19,299	55,210	88,689	36,287	
Aden .	—	500	100	—	—	100	287	—	—	—	
Other British Possessions .	41	—	69	95	17	910	—	120	—	—	
Total British Empire .	219,753	189,983	47,041	58,144	22,122	12,224	19,586	55,330	88,689	36,287	
To France .	474,329	365,273	438,235	411,417	358,065	369,827	140,636	27,142	32,492	177,012	
Italy .	6,269	10,445	6,719	23,858	1,490	—	—	—	1,350	—	
Siam .	—	—	—	—	—	—	—	—	1,735	5,337	
Turkey, Asiatic .	1,210	20	—	20	—	—	—	—	—	—	
United States .	29,072	15,645	8,940	596	—	—	—	—	900	—	
Other foreign countries .	100	200	200	—	—	30	—	240	—	—	
Total Foreign Countries .	510,980	391,583	454,094	435,891	359,555	369,857	140,636	27,382	36,477	182,349	
Total Raw Silk .	730,733	581,566	501,135	494,035	381,677	382,081	160,222	82,712	125,166	218,636	
CHASAM OR WASTE :											
To United Kingdom .	154,039	139,659	331,651	260,516	263,330	255,239	205,017	164,082	214,019	181,785	
Other British Possessions .	—	—	—	—	168	989	—	110	—	—	
Total British Empire .	154,039	139,659	331,651	260,516	263,498	255,228	205,017	164,192	214,019	181,785	
To Germany .	6,200	—	—	—	—	3,681	5,078	—	—	—	
Belgium .	—	—	—	—	—	—	59,080	—	—	—	
France .	840,999	960,220	1,036,007	808,884	750,748	627,166	539,678	148,823	545,070	603,813	
Italy .	91,518	82,812	117,140	77,819	73,968	54,860	100,224	34,739	656	13,440	

TABLE V. EXPORTS OF SILK (UNMANUFACTURED) FROM INDIA, 1907-8 TO 1916-17
Table showing Shipments from different Provinces

From	1907-8.	1908-9.	1909-10.	1910-11.	1911-12.	1912-13.	1913-14.	1914-15.	1915-16.	1916-17.
BENGAL:	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
Raw . . .	512,142	453,128	319,702	327,947	190,437	102,587	52,961	28,905	23,837	70,467
Chasam (waste) . . .	664,263	532,350	762,315	578,645	501,699	426,573	444,680	182,165	367,740	313,978
Cocoons . . .	71,042	27,400	44,428	58,281	69,510	77,147	74,271	69,486	32,510	81,550
Total . . .	1,247,447	1,012,878	1,126,445	964,873	761,646	606,307	571,912	280,556	424,087	465,995
BOMBAY:										
Raw . . .	217,391	13,851	100	—	—	550	—	—	409	7,758
Chasam (waste) . . .	61,794	13,993	59,341	42,965	75,650	57,224	71,380	36,101	64,064	87,895
Cocoons . . .	31,471	33,835	28,083	11,000	4,825	2,930	2,932	3,856	—	206,442
Total . . .	310,656	61,679	87,524	53,965	80,475	60,704	74,312	40,017	64,473	302,095
SIND:										
Raw . . .	1,200	114,587	181,333	166,088	191,240	278,944	107,261	53,467	100,920	140,411
Chasam (waste) . . .	—	64,826	109,401	178,172	129,630	135,849	112,408	38,476	44,542	17,118
Cocoons . . .	—	—	7,168	126,972	180,216	204,848	40,764	9,944	304,409	232,341
Total . . .	1,200	179,413	297,902	471,232	501,086	679,641	260,433	101,887	449,871	389,870
BURMA:										
Raw . . .	—	—	—	—	—	—	—	340	—	—
Chasam (waste) . . .	6,045	7,834	4,191	—	5,758	29,211	24,543	21,763	9,603	9,053
Total . . .	6,045	7,834	4,191	—	5,758	29,211	24,543	22,103	9,603	9,053
MADRAS:										
Chasam (waste) . . .	361,282	563,688	550,300	347,461	380,027	294,286	256,066	69,189	307,171	370,994
Cocoons . . .	16,496	8,152	9,250	13,020	20,954	7,692	15,832	2,530	7,598	6,096
Total . . .	377,778	571,840	559,550	360,481	400,981	301,978	271,898	71,719	314,769	377,090
Grand Total . . .	1,943,126	1,833,644	2,075,612	1,850,551	1,749,946	1,677,841	1,203,098	516,282	1,262,803	1,544,103

Notes: The above figures are taken from the Annual Statements of the Sea-borne Trade of British India.

TABLE VI. EXPORTS OF RAW SILK, CHASAM AND COCOONS FROM INDIA, 1907-8 TO 1916-17

Table showing Shipments from different Provinces

RAW SILK :	1907-8.	1908-9.	1909-10.	1910-11.	1911-12.	1912-13.	1913-14.	1914-15.	1915-16.	1916-17.
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
Share of Bengal .	512,142	453,128	319,702	327,947	190,437	102,587	52,961	28,905	23,837	70,467
Bombay .	217,391	13,851	100	—	—	550	—	—	409	7,758
Sind .	1,200	114,587	181,333	166,088	191,240	278,944	107,261	53,467	100,920	140,411
Burma .	—	—	—	—	—	—	—	340	—	—
Total.	730,733	581,566	501,135	494,035	381,677	382,081	160,222	82,712	125,166	218,636
<hr/>										
CHASAM :										
Share of Bengal .	664,263	532,350	762,315	578,645	501,699	426,573	444,680	182,165	367,740	313,978
Bombay .	61,794	13,993	59,341	42,965	75,650	57,224	71,380	36,161	64,064	87,895
Sind .	—	64,826	109,401	178,172	129,630	135,849	112,408	38,476	44,542	17,118
Madras .	361,282	563,688	550,300	347,461	380,027	294,286	256,066	69,189	307,171	370,994
Burma .	6,045	7,834	4,191	—	5,758	29,211	24,543	21,763	9,603	9,053
Total.	1,093,384	1,182,691	1,485,548	1,147,243	1,092,764	943,143	909,077	347,754	793,120	799,038
<hr/>										
COCOONS :										
Share of Bengal .	71,042	27,400	44,428	58,281	69,510	77,147	74,271	69,486	32,510	81,550
Bombay .	31,471	33,835	28,083	11,000	8,225	2,930	2,932	3,856	—	206,442
Sind .	—	—	7,168	126,972	180,210	264,848	40,764	9,944	304,409	232,341
Madras .	16,496	8,152	9,250	13,020	20,954	7,692	15,832	2,530	7,598	6,096
Total.	119,009	69,387	88,929	209,273	275,505	352,617	133,799	85,816	344,517	526,429
Grand Total .	1,943,126	1,833,644	2,075,612	1,850,531	1,749,946	1,677,841	1,293,098	516,282	1,262,803	1,544,103

Note : The above figures are taken from the Annual Statements of the Sea-borne Trade of British India.

II

THE SILK TRADE OF THE WORLD

SUMMARY OF GENERAL INFORMATION PREPARED AT THE IMPERIAL INSTITUTE

THE silk industries fall into two main classes, the finished products of the first being the raw materials of the second. The first class, with which the present enquiry is principally concerned, have for their chief ultimate object the production of yarn ; these industries may be termed the silk-producing processes. The second class are devoted to the weaving and dyeing of fabrics, and are usually distinguished as silk-manufacturing trades. In the first class we have, as more or less distinct industries, the selection of disease-proof eggs (the French *grainage*) ; the cultivation of the mulberry (the food-plant of the chief domesticated species of silkworm) ; sericulture, the rearing of the silkworm from the egg to pupation ; reeling, the winding of net silk from the cocoon ; throwing or twisting singles into organzine, etc., etc. ; and the carding and spinning of waste silk. The silk industries have almost always, and in all countries, been subsidiary to agriculture or to other trades. The greater cost of silk as compared to other textile fibres is mainly the result of the larger amount of manipulation required in its manufacture ; and, to keep down the necessarily high price, sericulture, reeling, and weaving have been mainly carried out by women and children, whether in the cottage industries of China, Japan, Northern Italy and Southern France, or in those large American factory towns in which the male population is mainly employed in the iron and steel trades. International competition in silk production has been almost entirely a question of the relative cheapness of labour.

It is difficult to obtain trustworthy figures with reference either to consumption or production of silk. A large proportion of the weight of silk fabrics represents tin compounds and other adulterants; great quantities of material, much of which passes as "silk," contain large admixtures of wool or cotton; and real, or net silk, almost entirely the product of the mulberry-feeding silkworm (*Bombyx mori*), is mixed not only with spun or waste silk, largely produced by the oak-feeding Saturnid "wild," or "tussah" moths, but also with artificial silks, or lustra-cellulose. The countries producing raw silk are treated statistically in three groups, which may be termed Far East, Near East or Levantine, and European. The Far East group comprises China, Japan, India and Indo-China; the Near East, Persia, Turkestan and Central Asia, Asiatic Turkey, including Anatolia and Syria, the Caucasus, European Turkey, the Balkan States, Greece, Crete and Cyprus; the term European including Italy, France, Spain and Austria-Hungary. The vilayet of Salonika was, until 1913, included in Turkey in Europe, but is now grouped with Greece, leaving only the vilayet of Adrianople as representing European Turkey; and the small yield of Cyprus has been somewhat variously assigned. In China and Japan, which probably produce between them nine-tenths of the world's supply of raw silk, the home consumption is enormous; but it is difficult to ascertain the true ratio which this consumption bears to the export. The Lyons authorities, to whom we are mainly indebted for statistics of silk production, have been content to represent the productions of China, Japan, India, Persia and Turkestan by the amounts exported from those countries respectively, so that the figures thus recorded do not represent the whole of the world's production of raw silk, which at the present time probably considerably exceeds 100,000,000 lb. per annum. (See table on p. 35 *supra*, in which China and Japan are represented by exports only.)

The average annual production of the main silk areas in the world during the present century is given for three quinquennial periods, and for the four years 1916-19 in the following table, in which, however, the Persian,

Chinese, Japanese and Indian figures represent exports only, while the Near Eastern figures during the period of the war are mere estimates.

WORLD'S AVERAGE ANNUAL PRODUCTION OF RAW SILK FOR 1901 TO 1919;
IN LB.

WESTERN EUROPE :

	1901-1905.	1906-1910.	1911-15.	1916-19.
France . . .	1,357,400	1,284,154	887,166	468,543
Italy . . .	9,494,211	9,797,459	7,977,864	6,042,538
Spain . . .	177,640	163,398	160,264	168,124
Austria-Hungary	681,703	790,023	612,457	340,107 ¹
Total . . .	11,710,954	12,035,034	9,637,751	7,019,312

NEAR EAST :

Asiatic Turkey and Cyprus . .	2,219,360	2,516,458	2,089,104	1,300,750 ¹
Salonika and Adrianople . .	516,560		{ 357,151	66,150 ¹
Balkan Provinces	310,200	1,367,450	{ 288,813	220,500 ¹
Greece and Crete	140,800		{ 245,603	242,500 ¹
Caucasus . . .	862,489	1,090,464	565,013	275,625 ¹
Persia and Tur- kestan . . .	1,030,040	1,277,937	886,266	187,425 ¹
Total . . .	5,079,449	6,252,309	4,431,950	2,292,950 ¹

FAR EAST :

China . . .	13,923,800	15,885,692	16,379,389	15,464,022
Japan . . .	10,716,200	16,393,012	25,206,853	36,768,886
India . . .	660,245	607,647	274,262	253,815
Indo-China . .	—	—	29,102	15,584
Total . . .	25,300,245	32,886,351	41,889,606	52,520,289
Grand Total .	42,090,648	51,173,694	55,959,307	61,814,551

¹ Estimate only.

² Previous to 1913 the vilayet of Salonika was in Turkey in Europe.

Chinese Production.—In an estimate by M. Rondot of Lyons in 1879, Chinese production of mulberry silk is stated as 16,625,700 lb., of which 9,503,550 lb. were exported, leaving only 7,122,150 lb. for home consumption, so that the export and home consumption are approximately in the ratio of 57 : 43. In 1894, however, M. Rondot seems to have realised that he had allowed too little for home consumption, and in his *L'Industrie de la Soie en France* of that year, he puts production at 23,152,500 lb., and export at 10,473,750 lb., leaving 12,678,750 lb. for home consumption, a ratio of about 42 : 50. The detailed figures for 1878-9, however, compiled by the Chinese Customs authorities for all the provinces of the Empire at M. Rondot's request, give total productions of 30,600,000 lb. and 34,000,000 lb., with exports of 8,601,705 lb. and 9,503,550 lb., leaving 21,998,295 lb. and 24,496,150 lb. for the home consump-

tion in the two years, a ratio of 27 : 73, approximately. A report by the Swiss Consul-General in Yokohama in 1905 gives figures similar to those of the Chinese Customs, viz. 33,075,000 lb. production, 24,255,000 lb. home consumption, and 8,820,000 lb. export, a ratio of 73 : 27. By 1905, however, the actual export from China was about 13,000,000 lb. or more, and we have no means of knowing whether the total production in the country has increased in the same proportion as have the exports. These latter have risen steadily, being about 6,615,000–9,922,500 lb. between 1872 and 1890, 11,025,000–14,332,500 lb. between 1890 and 1906, averaging 15,885,692 lb. between 1906 and 1911, and 16,379,389 lb. between 1911 and 1915. At the ratio of 73 : 27 the last-mentioned export would indicate a home consumption of 44,285,012 lb. and a total production of 60,664,401 lb. China is thus by far the greatest silk-producing country in the world, the industry centring between 30° and 35° N., or roughly the Yangtze Valley, so that Shanghai is the greatest raw silk market in the world. Modern methods of reeling are coming in by way of Canton, and a school of sericulture at Yunnan is a step toward placing silk as a crop in the position left vacant by opium.

Japanese Production.—Japan is particularly well suited for sericulture. The small proportion of her area suitable for arable cultivation leaves ample room on the hill-sides for the mulberry, and the dense population has hitherto been content with a low rate of payment for their labour. Her export of raw silk increased 50 per cent. between 1906 and 1910, being at the close of that period about 20,000,000 lb., with a value of 13½ million sterling, 28·5 per cent., that is, of the entire export trade of the country.

It is, perhaps, even more difficult to estimate the total Japanese production of silk than to guess at the Chinese total. The enormously rapid development of the industry in Japan is a much more modern process than is the case with China, and is so intimately related to the expansion of the export trade that there is little reason to presume any increase of the home consumption at all proportionate. M. Rondot, in his *L'Industrie de la Soie*, already

quoted, puts the Japanese production of raw silk in 1894 at 8,599,500 lb., the import at 22,050 lb., and the export at 6,262,200 lb., leaving 2,359,350 lb. for the home consumption, a ratio of export to home consumption of 11 : 4. The Swiss report of the Swiss Consul-General at Yokohama in 1905, previously quoted, gives a production of 16,537,500 lb., with an export of 9,922,500 lb. (wrongly described as "the largest in the world"), and a home consumption of 6,615,000 lb., giving a ratio of export to home consumption of 3 : 2 ; but the records show that the actual export from Yokohama in 1905 was 10,230,000 lb., and that from China 12,936,000 lb., and that the Japanese export surplus did not apparently exceed the Chinese total until 1909. The published official statistics of Japanese production of raw silk, as compared with those of the exports from Yokohama, indicate a home consumption during the twelve years 1903-14 ranging from 3,688,143 lb. in 1904 to 9,565,109 lb. in 1914, and averaging, for 1903-13, 5,728,528 lb. The exceptionally large amount retained for home consumption in 1914, taken in connection with the reduced export for that year (5,224,954 lb. less than in the previous year), may be rather the result of the outbreak of war, the expansion of Japanese weaving industries belonging rather to succeeding years. The Japanese import of cocoons from China rose in 1915 to 18,334 piculs from 6,532 in 1914, and that of raw white reeled silk to 1,459 piculs from 69 ; the value of the total Japanese imports of tissues, yarns and materials of silk rose in the same year to £456,950 from £254,628 ; that of the Japanese production of silk fabrics was £10,461,717 in 1914, £12,404,188 in 1915, and £16,341,897 in 1916 ; and that of the Japanese exports of silk tissues, yarns and materials rose from about £21,000,000 in 1914 and 1915 to £34,481,305 in 1916, and to £45,131,765 in 1917. These figures to some extent bear out the opinion that Japan is becoming more and more a manufacturing country, the industry there changing from one of sericulture and incidental manufacture to one of manufacture for export of raw material largely imported—mainly from China. It is thus not improbable that a relation may develop between Japan and the

United States with regard to silk analogous to that which is now obviously operative between the United States and the United Kingdom in reference to cotton, viz. the country hitherto producing the raw material mainly for export will, to a growing extent, manufacture its produce at home and thus become a competitor in the world's markets for the fabric.

In estimating Japan's present total production of raw silk, it would thus appear that we must add at least about 5,750,000 lb. as consumed locally to the 44,000,000 lb., the approximate export in 1917, making a total production nearly approaching 50,000,000 lb. Figures of the Japanese home consumption for 1917 and 1918 in bales indicating an all-round increase, are as follow :

	1917.	1918.	Percentage increase.
Raw silk . . .	198,500	249,700	25
Douppions . . .	62,300	79,800	more than 30
Spun silk . . .	50,000	64,650	nearly 30
Total . . .	<u>310,800</u>	<u>394,150</u>	<u>nearly 30</u>

From 1912 the United States has taken five-sevenths or more of the Japanese export of raw silk, this representing about five-sixths of the American total import. The total amount exported by Japan in 1917, viz. 43,976,287 lb., has been stated as 64·7 per cent. of the estimated exportable surplus of the world, the joint contribution of China and Japan being more than 85 per cent. of that amount, viz. 58,320,820 lb. out of 68,010,926.

Indian Production.—The contribution of India to the silk in commerce, which, during the last quarter of the eighteenth and the greater part of the nineteenth century, exceeded 1,000,000 lb. per annum, and during the last half of the latter century frequently exceeded 2,000,000 lb., has during the present century been a rapidly declining amount. From 1857, when the utilisation of waste silk began in Europe, and more markedly after 1877, from the effects of Lord Masham's invention of carding and spinning silk waste, Indian silk exports changed their character, the waste and wild silk trade improving, while that in reeled silk declined, so that quantities were kept up, though represented by a lower value. In 1880–1 the exports from British India were 551,000 lb. of reeled silk

and 788,000 lb. of *chasam*, or "waste" silk, valued together at 55 lakhs; in 1900-1 the figures were 560,000 lb. of reeled, and 1,031,000 lb. of waste, valued together at 51 lakhs. "The exports of manufactured silks have shown a still more serious decline. In 1886-7 they were valued at 32 lakhs, in 1896-7 at 16 lakhs, and in 1903-4 at only 8 lakhs. In both raw silk and silk manufactures India now receives far more than she gives. The imports of raw silk were, in 1876-7, 1,461,000 lb., valued at 45 lakhs; twenty-five years later (1900-1) they were 2,535,000 lb., valued at 102 lakhs. There has since been a temporary decline, very possibly an after-consequence of famine and plague, the imports in 1903-4 having been 1,544,000 lb., valued at 59 lakhs. The imports of manufactured silks show a remarkable expansion. In 1876-7 these were valued at 58 lakhs, and five years later at 35 lakhs. In 1903-4 they rose to 183 lakhs, the highest figure yet attained. Thus not only is India failing to produce silk goods suitable for the demands of other countries, but she is opening her own markets to a foreign competition that must tell disastrously on the local handloom weavers" (*Imperial Gazetteer of India*, vol. iii. (1907), pp. 211-12). The chief silk-producing Province of India is Bengal, while Burma and the Punjab are the largest consuming Provinces. It is significant, however, that "the Bengal production influences but slightly the manufacturing centres of India. Bombay imports its supplies from China, and distributes raw silk thus obtained to Northern and Central India. All but one of the filatures of India are located in Bengal. In 1891 there were 81, and in 1903 these had decreased to 63, which gave employment to 9,000 persons. Three large silk-mills (two in Bombay, and one in Calcutta) are worked by steam-power, and are almost exclusively concerned with the Burmese market, a trade that was formerly concentrated very largely in Glasgow, but is now shared by Japan. There are also some twenty to thirty handloom factories, mostly in Bengal. The Bengal factories of to-day largely work up *tasar* silk, in place of preparing the *korah* silks formerly turned out by them; they are owned and managed by natives and do not employ

European machinery" (*ibid.*, pp. 208-9). A more recent estimate, based partly upon official figures, given by Mr. Rawlley (*Economics of the Silk Industry*, p. 204) for an average of the years 1911-12 and 1912-13, puts

	lb.
Raw silk produced in India . . .	2,360,000
„ „ imported into India . . .	2,870,000
Total . . .	5,230,000
Raw silk exported from India . . .	1,710,000
Balance available for consumption in India . . .	3,520,000

The discrepancy between the amount of export here given and the average of the figures officially recorded for those years (see tables, pp. 53-8 *supra*), arises from the inclusion by Mr. Rawlley under "Raw Silk" of waste and cocoons, much of the former being the produce of wild worms. The production of the well-organised industry in Kashmir, which has had some effect in masking the decline in Indian production since its incorporation in the Indian Returns in 1905, only reached 215,749 lb. in 1911-12 and has, owing to unfavourable weather and a destructive fire, shown a decline in succeeding years. Of 224,000 silk-worm rearers in India, 80,000 are in Kashmir, 70,000 in Mysore, and 43,000 in Bengal; and, of the total raw silk produced, 50 per cent. comes from Mysore, whence it is exported to Madras, the waste coming to Europe. Patiala, where the silk industry has been managed since 1914 by a native trained at Montpellier, put silk on the European market only in 1916; and the Indo-Chinese industry (which, though more than two thousand years old, has only recently entered the export trade) has not yet reached an export of 40,000 lb.

NEAR EAST.—The unorganised condition of the sericultural industry in the Near East makes it very difficult to obtain any precise figures as to production, so that those published are merely rough estimates.

Persian Production.—The cultivation of the silkworm, in addition to the transport trade in Chinese silk, is of great antiquity in Persia. Down to the middle of the last century silk was the staple of Persian export trade; but in 1864, the year of highest production,¹ pebrine appeared: by 1869 the output had fallen 80 per cent.;

¹ The production for that year is given as 2,190,000 lb., value £1,000,000.

and the trade of Gilan has never entirely recovered. In 1885 Persia's entire produce for sale averaged about 600,000 lb., of some £200,000 value, two-thirds of which was furnished by Gilan. Lord Curzon wrote in 1892 : " In despair . . . the peasants have turned to other crops . . . tobacco, olives, opium, rice. . . . It is doubtful whether, at least in Persian hands, the silk industry will ever permanently revive. Under other auspices, a different tale might soon be told, the disease having been expelled and soil and climate remaining what they formerly were." A good deal of the silk of Gilan was made into sewing-silk at Resht, and there were native manufactures of velvet, brocade, shawls and carpets. Almost as Lord Curzon wrote, a revival was beginning, M. Bezanos, a Greek merchant, representing the firm of Pascalidi Brothers, of Broussa, having from 1891 onwards introduced eggs raised on Pasteur's cellular system, giving away not more than two ounces to each rearer, and stipulating for a third of the resultant cocoons. The import of eggs in 1896 was stated to be 90,000 oz., and in 1897 114,000 oz., which, at 2 oz. per tilambar or hatching-shed, each tilambar employing three men, represents 135,000 and 170,000 rearers in those two years. The dry cocoons were baled and sent by sea to Baku, and thence to Batoum, and then by sea to Marseilles, though most silk produced at Resht was reeled locally, and either woven in Persia or exported via Baghdad. The reeling was stated in 1902 to be so defective as to produce silk totally unsuitable for European mills. After 1893 the mulberry is said to have been much planted, and the cocoons to weigh twice as much as when produced from native eggs. The following table, compiled as is most of the recent history given above, from the Reports of Mr. Consul Churchill, gives the weight and value of the dried cocoons exported from Gilan.

Year.	lb.	Value. £	Year.	lb.	Value. £
1893 . .	76,160	6,475	1902-3 . .	3,366,000	247,502
1894 . .	167,552	11,780	1903-4 . .	—	—
1895 . .	235,760	15,505	1904-5 . .	—	218,846
1896 . .	229,040	14,040	1905-6 . .	—	215,578
1897 . .	346,080	23,550	1906-7 . .	2,497,339	302,384
1898 . .	614,880	55,800	1907-8 . .	2,937,558	473,289
1899 . .	1,178,688	112,350	1908-9 . .	1,879,813	204,626
1900 . .	1,615,488	150,265	1909-10 . .	2,391,187	—
1901 . .	—	—	1910-11 . .	2,511,214	—
			1911-12 . .	2,415,000	—

The weight and value of the cocoons exported, as against the value of the imported eggs, have been as follow :

SILK PRODUCTION IN PERSIA ¹

Year.	Value of silkworms' eggs imported.	Weight of dry cocoons exported.	Value of cocoons exported.
	£	lb.	£
1906-7 . . .	52,130	2,717,000	240,149
1907-8 . . .	64,862	3,250,000	481,313
1908-9 . . .	55,396	2,093,000	215,150
1909-10 . . .	52,036	2,600,500	308,844
1910-11 . . .	46,865	2,697,500	297,047
1911-12 . . .	61,297	3,048,500	323,117
1912-13 . . .	—	2,044,035	—

¹ From the " Statistical Abstract for Foreign Countries, 1901-12," pp. 250-3.

The closing of the Dardanelles in 1914, stopping exportation by the routes previously usual, the silk of Persia found a market, with that of Turkestan, in Russia; and the practical exclusion of all Levantine silk from Western European commerce during 1916 and 1917 has necessitated the substitution in the table on p. 35 of an estimated equality for those years with the production of 1915 for any actual amounts.

Caucasian Production.—The white mulberry is considered by De Candolle to be not indigenous, but naturalised by ancient introduction on the south-western plateaux of Asia; and the occurrence of spring frosts and severe droughts renders the leaf-crop and consequently the yield of cocoons uncertain. In the Caucasus, according to official statistics, there are more than 3,000 villages comprising 400,000 families, or some two million persons, engaged in sericulture, but the yield of fresh cocoons fluctuates according to the season between 4,900 and 6,800 metric tons. In the middle of the last century the silk industry was one of the chief sources of the income of the population, and there were large mulberry plantations throughout the country, while even domestic servants were habitually clad in silk; but disease appeared about 1860, and the industry has never recovered. Ruins of former silk-factories and the remains of large mulberry orchards are numerous throughout Eastern Caucasia. Before this murrain Central Asian varieties of the silkworm were bred; but subsequently Japanese Green, White Baghdad, and Yellow French were introduced,

the Russian Government establishing an Institute at Tiflis in 1887, where by 1893 no less than seventy varieties were raised experimentally. Several branches of the Tiflis Institute have been subsequently established for the distribution of sound eggs and for teaching, travelling instructors with "ambulating laboratories" have been employed and instruction in sericulture is given in the village schools. Previous to 1899 foreign eggs were not inspected at the port of entry, and, being cheaper than the "cellular grain," were bought with serious results; but during the present century pebrine has been absent, imported seed being strictly examined by the Imperial Agricultural Society at Tiflis, and by the Government, and none allowed to be sold without a certificate of testing. The eggs are now chiefly imported from Broussa and from Italy. Silk production increased steadily during the first decade of the century, and it may be doubted whether the figures for 1911 onwards indicate any real decline in the industry before the outbreak of war. In Turkestan and Transcaucasia some organzine and tram are thrown in the Asiatic method; but much of the silk is wound by steam filatures in Transcaucasia or sent as cocoons to Moscow, in which neighbourhood there are extensive throwing-mills with Italian and American machinery, and the greater part of the silk grown within the Russian Empire is woven, together with a still larger amount of imported silk.

Asiatic Turkey.—The mulberry and sericulture are very generally distributed throughout Asiatic Turkey, the chief districts being Broussa, Northern Syria and Lebanon, the ports of which are Beirut, Tripoli, Ismidt and Diarbekir. Rich silks were woven at Broussa early in the sixteenth century; and, before the commencement of our direct silk trade with India in 1621, England was dependent upon Turkey for raw silk. The recent history of the industry has been typical of that of many others. It suffered severely from the epidemic of pebrine in the seventh decade of the last century, which attacked the local breed of silkworm that gave the much-esteemed large white cocoon. Japanese eggs were introduced and the trade, which has always been closely dependent upon

the French market, quickly recovered, so that by 1880 there were still a large number of sericulturists in the Lebanon; the industry rivalled tobacco as the staple product of Syria, and the export from Broussa was about £350,000 in annual value. Mainly by the efforts of M. P. Genadius between 1883 and 1889, Pasteur's system of egg-selection was introduced at Broussa, and sound eggs and trained sericulturists were sent from the Broussa Institute to all parts of Asia Minor and farther afield to Tiflis and Cyprus. The eggs were mainly imported from France, and the cocoons or reeled silk exported to Marseilles.

Syrian Production.—By 1895 much land in Syria formerly devoted to grain was planted with mulberry, and many of the peasants of the Lebanon became wholly dependent on the sale of the cocoons. The fine Syrian silk is mainly employed at Lyons and Saint Étienne, in the manufacture of laces and other high-class fabrics much of which found its market in London, so that a falling off in the English demand, caused by the South African War in 1899, led to temporary distress in the Lebanon in the following year. Nevertheless, in the ten years 1897 to 1907, whilst the production in the Far East had increased 50 per cent., that of the Levant had more than doubled itself. In the latter year there were 115 filatures at Broussa, with an output of about 1,102,500 lb. of raw silk. Already by 1902, however, the Lyons Silk-merchants Association reported the emigration of Syrian labour consequent on heavy Turkish taxation, and the hampering of the growth of the industry by the lack of transport facilities. The weavers of Beirut, Damascus and Aleppo chiefly employed the stronger Chinese silk imported from Shanghai to Beirut and Tripoli, the local produce being almost wholly exported to Europe. The low rate of wages led to this emigration, women and girls being paid 6-7 pence a day for winding, and 1-2 francs a day of ten hours for weaving, and men 1½*d.* per lb. for throwing tram, and 5*d.* per lb. for organzine, earning 2-2½ francs for a twelve-hour day, and from 1½-3 francs a day for weaving. Thousands of the peasants went to North and South America, Africa and Australia, many of whom

were skilled rearers of the mulberry and the silkworm. America having become one of the largest consumers of silk, and rivalling Saint Étienne in the output of ribbon, the financial crisis of 1907 seriously affected the demand at Lyons; but its effect on Syria was, perhaps, somewhat counteracted by the earthquakes of Messina and Calabria in the following year, which ruined the district whence Lyons had obtained "Messina," its choicest raw material.

Soon after this the competition of the better-reeled silks of Japan and those of China, produced by labour even cheaper than that of Syria, began to be felt in Asia Minor, and the Levantine industry appears to have reached its maximum in 1909. Its decline was hastened by the coming in of the sheath, or hobble skirt, which brought about the *crise d'aulnage*, as it was termed at Lyons, the *metre crisis* of the Italian market in 1911 and the succeeding years, and is estimated to have reduced the world's consumption of silk by over 2,200,000 lb. The mulberry-trees were largely uprooted, and the men took to growing tobacco and oranges and the women to lace-making. Several bad seasons in succession hastened this process, a dry spring producing small dry leaves on the mulberry, so that the whole import of eggs cannot be used, and the price falls. Up to 1909 some 270,000 to 300,000 25-gram boxes of eggs were shipped from the Department of Var about the middle of each August, reaching Beirut in the first week of September, were distributed at the end of October to the monasteries near the snow-line on the Lebanon, and kept cool till March 19th, on which date they were all put in incubators; and, after hatching, were kept in special straw huts till May 10th-15th, when the worms began to spin. There were then some 150 filatures in Syria turning out a uniformly fine quality of silk in skeins of standard size, made up into bales of 220 lb. each:

The following table, compiled from the British Consular Reports, gives the export of cocoons and waste silk, and of raw silk from Beirut and Tripoli, for the first twelve years of the present century.

Year.	From Beirut.		From Tripoli.	
	Cocoons and waste silk.	Raw silk.	Cocoons and waste silk.	Raw silk.
	Bags. ¹	Bales. ²	Bales. ²	Bales. ²
1901	2,125	2,300	330	630
1902	1,950	3,200	370	750
1903	2,400	3,700	300	531
1904	3,600	4,500	300	600
1905	2,850	3,600	1,500	500
1906	2,725	3,560	530	708
1907	2,320	3,600	750	654
1908	2,100	3,500	—	550
1909	1,540	3,050	—	510
1910	2,240	4,200	2,835	955
1911	1,800	2,670	2,197	230
1912	1,260	2,455	1,500	250

¹ Of 90–160 lb. weight.² Of about 2 cwts.

The total production of fresh cocoons in the Turkish Empire was estimated in 1912 as 33,000,000 lb., 80–85 per cent. of which was reeled in the country and the rest exported, the export of reeled silk being then about 1,100,000 lb. from Syria, and 1,540,000 lb. from Broussa and Adrianople, whilst the few native hand-loomers consumed comparatively little. Only a third of the mulberry-trees are stated to have survived the war, mulberry-logs being commonly sold for fuel in Constantinople; and the output of cocoons is said to be now less than 7,000,000 lb.

Cyprus Production.—Cyprus possesses a climate exceptionally favourable to sericulture: Cyprus silks have been renowned for their quality since the sixth century: the mulberry flourishes throughout the island, although but little care is given to its cultivation and it is commonly exhausted by being stripped of its leaves twice in the year; and at one time the island produced 70,000 to 80,000 lb. of silk yearly. During the European pebrine epidemic of 1845 Cyprus eggs were in request; but the disease reached the island, and by 1880 the annual output had fallen to 5,000–8,000 lb. Instructions on the proper methods of rearing silkworms were published in 1878: a number of men were trained in sericulture at Broussa: in spite of the opposition of merchants importing eggs from France, the production of eggs according to Pasteur's cellular system by locally trained licensees was encouraged; and a model rearing-house was established at Nicosia. The cocoons produced were pronounced by Sir Thomas

Wardle to be of very fine quality, and the export increased from an annual average of 36,579 lb. during the five years 1879-83 to 100,873 lb. during the three years 1894-96 (Tyler, *Development of Cyprus*, p. 78). In 1896, however, the yield was only 15½ kilograms of fresh cocoons per ounce of eggs, as against an average of 30 kilograms per ounce at that time in Italy, and 35 kilograms in France. Bad rearing conditions, such as overcrowding, lack of ventilation, want of cleanliness and inadequate feeding, have had to be contended with, and it is now realised that it is essential to stop the use of inferior eggs as well as to supply better. A simple incubator made from a petroleum packing-case has been introduced, to supersede the practice of hatching the eggs on the women's persons; and five rearing-stations have been established under the management of trained students. The export, which rose from 91,775 lb. in 1902 to 134,845 lb. in 1907, fell in 1908 to 107,075 lb.; but, with the measures then taken by the Department of Agriculture to improve the conditions of rearing, it rose in 1911 to 160,782 lb. The cocoons have improved in size and uniformity of colour; but the rearers have been unable to adapt their methods to sudden weather-changes. For the six years ending 1913 the total production averaged 140,000 lb., a yield of about 18 kilograms of fresh cocoons per ounce of seed; but between 1913 and 1916 hot, dry winds prevailed, and many mulberry plantations were uprooted to make way for oranges and other fruit thought likely to be more remunerative; whilst in 1918-19, with rainy, uncertain weather, flacherie and pebrine were prevalent, and it was thought advisable to sacrifice nearly all the eggs. Until 1916 probably 25 per cent. of the rearers produced their own seed without any microscopic examination: the cocoons are mostly exported in the raw state to Lyons and Milan, forming a bulky and costly cargo; and the reeling carried out for silk for local consumption is conducted in so primitive a fashion that more than 25 per cent. is lost. From the account of the industry given by the Director of Agriculture (*Bulletin of the Imperial Institute*, 17, pp. 523-9), it appears that some improvement is looked for from the

introduction of modern reeling plant, the establishment of small local sericultural societies and the prevention of the sale of bad seed.

Production in Greece.—In Greece sericulture prospered most during the first half of the last century, when the annual production of raw silk was 4,000,000 or 5,000,000 lb. Pebrine reduced the yield in 1854 to a tenth of its former amount ; and the apparently stationary output between 1876 and 1890 was followed by some advance between 1891 and 1905, which is said to have been checked by the competition of Japanese silk, and later of artificial silk. In 1912 the Government encouraged the planting of mulberry-trees and the teaching of sericulture in rural schools, and inspected and controlled the eggs offered for sale. The average production of silk for the three years 1911–13 is stated to have been 1,288,000 lb., 82 per cent. of which was produced by Larissa, Laconia and Messenia. In 1911 the production of these provinces was 1,023,776 lb. Eggs were imported in 1912 to the extent of 68,000 ounces, in addition to 12,000 ounces produced locally, traders supplying the peasants for 10 per cent. of the produce. The pupæ are killed by drying in the sun or in an oven, or by steaming ; and, as only one filature remains at Calamata (Messenia), a large proportion of the produce is shipped as cocoons to France. The well-known Calamata handkerchiefs are made of silk grown, spun and woven in the neighbourhood.

Balkan States Production.—In Bulgaria the industry is in its infancy, nothing being known of it prior to 1900, and no organised attempt to encourage it having been made before the country became independent in 1908. The climate is dry and warm, and the mulberry flourishes up to an altitude of 3,000 feet. In the southern provinces, where the climate is most favourable, the cultivation of the mulberry and the silkworm have become leading occupations. The mulberry is grown in open fields, vineyards, and roadsides, as in Italy ; but more especially by itself in plantations in which the trees are $6\frac{1}{2}$ feet apart, either as coppice or more often as standards 3 feet in height. The ground is cultivated beneath them during the first four years of their growth, and planted with

maize, potatoes, etc. The sericultural methods are still primitive, and neither cleanly nor healthy. In 1902, 418,874 lb. of cocoons were reeled at Stanimaca, the only filature, where at one time there were 80 basins ; and in 1903, 485,012 lb., yielding 250,443 lb. of reeled silk, out of a total production of 2,824,471 lb. of cocoons produced in the whole of Bulgaria and Eastern Rumelia from 29,585 oz. of eggs, the bulk of the cocoons being exported to Italy and France. In 1908 the mulberry occupied about 3,952 acres ; but by 1912 this was almost doubled. The Government distribute mulberry-seed gratuitously, and all agricultural schools teach sericulture, whilst at three special centres, Sadovaj, Orhamie and Vratza weaving is also taught. All silkworms' eggs must by law be selected according to Pasteur's method, the chief varieties cultivated being White Bulgarian, Salonika, Italian and Yellow French. The latter varieties are imported to the extent of 500-700 kilograms annually. An ounce of eggs is found to give 88 lb. of the yellow variety of cocoon, or 132 lb. of the white. The general low price of silk in 1914-15 was depressing the industry, whilst the import of manufactured silk from Switzerland, Austria-Hungary and France was on the increase.

Production in Rumania.—Difficulty has been experienced by the Rumanian Government in overcoming the apathy and inertia of the peasants with regard to sericulture ; but in 1903, 5,500 oz. of eggs were reported as yielding 264,552 lb. of cocoons, and 21,164 lb. of raw silk (little more than a twelfth of the production of Bulgaria and Eastern Rumelia in the same year). In 1905 an Institute was established by Queen Elizabeth at Bukharest, which distributes eggs, collects the crop, dries the cocoons and sells them in Italy ; and since then sericulture and reeling were, down to the outbreak of war, making such steady progress that Rumania assumed the lead in these industries among the Balkan States. In 1909 a gram of eggs gave 1,238 grams of cocoons ; and, though in 1910 the yield was only 1,083 grams per gram, in 1911 there were 34,650 rearers, over 200,000 grams of eggs were hatched and 190,000 kilograms of cocoons produced.

In Serbia there has been a Silk Raisers' Association since 1895, and the Government distributed eggs gratuitously. The yield of cocoons grew from 1,560 kilograms in 1895 to nearly 150,000 in 1903, the production of raw silk in the latter year being over 28,000 lb.

Production in Austria-Hungary.—In 1860 Austria had about 100,000 persons engaged during part of the year in sericulture, and produced from 270,000 to 300,000 cwts. of cocoons, of which 6,000 were exported. In 1879 her export was 1,074,496 lb., her production of raw silk growing from 336,600 lb. on the average of 1881-5 to 790,023 lb. on that of 1906-10, after which year it exhibits a steady decline. The chief regions of production have been Hungary and the Trentino. In Goritz, Gradisca and Istria the industry has declined, in spite of a bonus given by the Government, in imitation of the French measures to maintain it, the peasantry finding in general that they can make more money by growing grapes or other fruit; but in Hungary, where the whole trade is a State monopoly, it has been fairly successful. Both young mulberry-trees and silkworms' eggs are distributed gratuitously, the cocoons are bought by the Government, and the filatures, which are of thoroughly modern type, are under Government control. Only waste cocoons are exported to Milan and Marseilles. The Hungarian output of cocoons was 1,342 metric tons (2,958,848 lb.) in 1902; 1,707 metric tons (3,763,704 lb.) in 1903, rising to 1,878 metric tons in 1911, but only 1,298 metric tons in 1912. The Trentino district of South Tyrol has been described as "a veritable geographical dependency of the Italian provinces of Lombardy and Venetia" in regard to sericulture, and the filatures, which are subsidised by the State, are of the latest Italian design. The output of cocoons was 1,170 metric tons in 1903, the average of the five preceding years being 1,525 metric tons; and the total Austria-Hungarian production for that year was 3,264 metric tons of cocoons yielding 275 metric tons (606,265 lb.) of raw silk. The export of cocoons took place through Trieste, through which port there was also a considerable import of raw material for Austrian looms; since, as pointed out by Sir Frank Warner (*Report of*

Committee of Board of Trade on Textile Industries, p. 40), the consumption in the Dual Monarchy for 1911, a normal pre-war year, was 807 metric tons—more than twice the production, which in that year was 217 tons for Austria and 135 for Hungary.

Spanish Production.—The modern history of sericulture in the Western Mediterranean countries has been one of a decline more marked than in Central Europe, and in Spain the downfall has been more complete than in France. Receiving the industry from the Moors, Spain was the first country in Europe to practise sericulture. The climate is well suited to the mulberry and the silk-worm, especially in the foot-hills of the Sierra Nevada; and in the sixteenth century there was a large production and manufacture of silk. Civil discord, heavy taxation, and, as a culmination, the pebrine epidemic of 1848, annihilated the industry so far as Seville was concerned; and the total production of raw silk in Spain, which was 171 metric tons in 1872, has not exceeded 100 tons since 1896; but, after keeping with difficulty at 1,100,000 kilos of cocoons (82,000 kilos of raw silk), fell in 1914 to 740,000 kilos, giving 73,000 kilos of silk, and in 1915 to 50,000 kilos. An attempt is now being made to rehabilitate the industry. A School of Sericulture has been established at San Juan de Azualforache, near Seville, and other model stations are being started, mulberry plants and eggs are being distributed and prizes offered for good rearing and reeling. The cocoon production in 1914-15 had reached 954,825 kilos, and for 1913, 1914 and 1917 an average of 1,240,806 kilos, but for 1918, 863,801, and in 1919, 880,586 kilos or only 71 per cent. of that average. The export of cocoons has fluctuated considerably; but averaged between 1901 and 1912, 54,478 kilos, while the import of raw and thrown silk during the same period averaged 311,615 kilos. In his estimate for 1911, Sir Frank Warner (*loc. cit.*) puts Spain's production of silk at 82,000 kilos, and her consumption at 133,000 kilos.

Italian Production.—From A.D. 1146, when Roger the Norman settled Greek prisoners at Palermo and in Calabria to teach his subjects sericulture and silk-weaving,

Italy has always occupied a leading place among both the silk-producing and the silk-manufacturing countries of the world.

In 1860 Italy produced 4,232 metric tons of raw silk, and 984 tons of waste, having a combined value of over twelve million sterling. Between 1863 and 1866 she suffered temporarily from the ravages of disease, but soon began to recover, her production rising from 20,000 metric tons of cocoons in 1880 to 50,000, which was nearly the average between 1904 and 1913, and culminating in 1907 with a yield of 57,058 tons of cocoons. There is a large import of cocoons from the Levant and the Far East, and the reeling both of these and of native-grown cocoons is mainly concentrated in the three northern provinces, Lombardy carrying out 60 per cent. of the whole, and with Venetia and Piedmont 80 per cent. The plains of the Po thus yield fully three-fourths of the European silk crop.

The following table, compiled from various sources, gives the weight of cocoons produced and imported into Italy, the weight of home-grown raw silk produced and the total production of raw silk in lb. during the present century.

Year.	Cocoons produced.	Raw silk (Italian) produced.	Cocoons imported.	Raw silk (total) produced.
1901	118,027,035	8,883,945	7,616,070	11,157,300
1902	123,457,600	9,871,785	9,223,515	11,995,200
1903	97,222,860	7,773,419	10,246,635	9,997,861
1904	124,838,435	10,804,500	7,499,205	12,460,455
1905	114,525,700	9,108,000	10,744,965	12,242,160
1906	118,712,790	10,439,000	12,328,155	13,333,635
1907	125,812,890	10,758,000	12,899,250	13,831,465
1908	117,290,565	9,869,200	9,948,960	12,123,090
1909	111,925,800	9,353,455	13,355,685	—
1910	105,760,620	8,703,135	9,666,720	10,784,655
1911	92,500,955	7,695,450	11,626,965	10,394,370
1912	104,671,350	9,051,725	10,617,075	11,481,435
1913	84,870,450	7,805,700	11,144,070	10,367,910
1914	—	8,952,300	—	—
1915	76,258,400	6,345,990	—	—
1916	78,969,320	7,964,460	—	—
1917	66,847,320	6,217,034	—	—
1918	65,128,200	5,942,475	—	—
1919	43,639,200	4,046,175	—	—
1920	59,500,000	—	—	—

At its highest point the industry seems to have included upwards of 90,000 silkworm rearers, incubating 1,000,000 to 1,200,000 oz. of eggs, *i.e.* 12 oz. to each peasant family engaging in the work, raising 125,000,000 lb. of cocoons,

or about 104 lb. per oz. of eggs, from which over 10,750,000 lb. of raw silk was obtained. The import of 5,850 metric tons (12,899,250 lb.) of foreign cocoons brought the total yield of raw silk for 1907 up to 13,831,465 lb., while in 1909 the number of mills is given as 2,413, employing 20,000 males and 212,000 female workers, at wages totalling £3,000,000. The imposition by France of a duty of 3 francs per kilo on Italian manufactured silk in 1892 gave rise to the rivalry between Milan and Lyons, which led to the transfer of the centre of the European silk trade from the latter to the former as completely as the removal in 1862 of the British duty on imported silk had transferred it from London to Lyons. Silk became not only the leading agricultural industry of Italy, with Milan for its centre, but the annual importation of over 2,000,000 lb. of raw silk from China and Japan to the Milan conditioning house made it one of the chief items in the foreign trade of Italy; and the silk-weaving industry, of which Como is the centre, contributed one of the leading articles of export. Among the causes assigned for the relative decline of the industry in Italy during the last ten years are emigration and the consequent rise in the cost of labour tempting many peasants to abandon sericulture for more remunerative work; the lessened demand from America, formerly the chief market for Italian raw silk, in consequence of the competitive cheaper supply from Japan; the fashion for skimpy skirts; the replacement of the former mixed cultivation of mulberries and wheat by rice-fields and meadows; the death of the mulberries from the deep ploughing and chemical manures employed for cereals; and the ravages for several years of the Japanese Mulberry Scale-insect (*Diaspis pentagona*).

Although far outdistanced by Japan throughout the present century, Italy still ranks third as to the quantity and first as to the quality of the raw silk produced by the countries of the world.

French Production.—In spite of previous *débâcles* well-nigh fatal, such as the Revocation of the Edict of Nantes and the Revolution, the production of raw silk in France culminated in the middle years of the nineteenth century.

With the ever-growing democratic demand for plain broad silk, it had risen from 500 metric tons to 1,000 between 1820 and 1830, from 1,000 to 1,500 tons between 1830 and 1840, and by 1854 it exceeded 2,000 tons per annum. The large breeders brought millions of worms together in one room, and, as generally happens when vast numbers of any one species of plant or animal are brought together, disease became epidemic. First noticed in the Cevennes in 1849, when a severe spring frost, killing many of the mulberry-trees, rendered the food-supply inadequate, it spread rapidly, seeming to precede the "graineurs" or buyers of silkworms' eggs, to Italy, Spain, Portugal, Turkey, the Caucasus and Turkestan, whither they went in search of a sound strain. Japanese eggs alone gave uniformly good results; but the introduction of Pasteur's remedial selection by "cellular incubation," which did not become universal in France until 1875, was powerless to prevent the decline of the industry. The cheaply produced silks of China and Japan, brought direct to Marseilles after the opening of the Suez Canal in 1869, without the intervention of London brokerage, had obtained a sure footing in the European market during the period of unsuccessful rearing (1850 to 1875); and a revolution in the relative importance of the sources of the raw material of the silk-weaving industries of Europe had begun, which was to be paralleled by a similar change in the main centre of the manufacture itself. Before the ravages of pebrine the silk-weaving industry in Europe had been mainly dependent upon raw silk of European production, Italian, French and Spanish, whilst the contribution of the Far East to the silk trade of the world consisted mainly of rare and costly woven goods from China and India, Japan being then closed to foreign commerce. Since the epidemic, China, and especially Japan, have been steadily increasing their share in the supply of the raw material. The production of cocoons in France between 1870 and 1874 was about 12,000 metric tons; between 1892 and 1901 it had fallen to an average of 8,615 tons; between 1904 and 1913 to one of 6,878 tons. The yield of raw silk, which may be calculated at about one-twelfth of the weight of the

cocoons, sank from 624 metric tons as an average between 1904 and 1909 to 405 tons in 1914, whilst the number of silkworm-rearers shows a similarly constant decline, from 133,000 in 1901 to less than 84,000 in 1914.¹ In 1844 sericulture was carried on in 64 Departments; it is now confined to 22, and mainly to Ardèche, Gard and Drôme. Among the causes assigned for the decline, most of which are likely to be progressively operative, are: the uncertainty of the price as largely dependent on the vagaries of fashion; the want of scientific methods and of organisation; the alleged competition of artificial silk, the production of which in France by 1912 was stated to be nearly four times as much as that of real home-grown mulberry silk; but, above all, the competition of silk grown in the Far East in improving qualities and in ever-growing quantities at a cost far below what is possible in France; and the extreme riskiness of the crop. Disease among the mulberry-trees, or among the silkworms, or some slight change of weather at a critical period in the breeding season, may kill the entire stock in a few hours; so that the peasant of the Rhone Valley has come to prefer some less lucrative but more certain source of revenue, such as his vines and olives.

In short, where there is some hope of maintaining or increasing the supply of cheap labour, improved sericultural methods and organisation may maintain or enlarge the output of raw silk. The prospect is more hopeful where the cultivation of a univoltine worm enables the industry to be carried on mainly by women and children, and during a part of the year, so that it is merely subsidiary to other forms of agriculture. The comparatively small yields of Spain, Hungary, Caucasus, Cyprus, Persia, Central Asia and Kashmir may be thus increased, and that of Italy maintained, but in most of these cases there is a probability of other crops proving more attractive. In France a silkworm-rearer makes about fifty shillings in the season, a little over a month, in which he thus supplements his agricultural earnings; in Bengal a whole family will earn about an equal amount by two

¹ See *Annuaire Statistique*, 35 (1916-18), pp. 60, 123-4, and *Statistical Abstract for Foreign Countries*, 1901-12, pp. 146-7.

months' work. It has been possible for a "paternal" Government to force sericulture upon Hungary, Kashmir and Patiala with considerable success; but the Bengal ryot can earn more by growing rice and jute; so that, unless sericulture can be carried on subsidiarily to such other forms of agriculture, it would be worse than useless to attempt to force him to grow silk. For the present, the cheap labour of Japan, and still more of China, dominates the situation, and there seems a probability that it will supply more than the present 85 per cent. of the world's raw silk. The following table (from *The American Silk Journal*, 38 (1919), p. 72), gives the approximate percentages of the world's export of raw silk during recent years:

		Japan.	China.	Italy.	France.	Other countries.
1913	.	44.4	31.2	13.0	1.3	10.2
1914	.	42.7	27.3	18.3	1.8	9.9
1915	.	50.7	30.9	12.2	.5	5.7
1916	.	53.0	27.8	13.3	.8	5.0
1917	.	57.6	26.0	10.5	.8	5.1

CONSUMPTION OF RAW SILK

The table on p. 35 (*supra*) gives an attempt to estimate the world's consumption of raw silk in 1913, omitting China and Japan as not readily estimable. During the war so few returns have been available that it has been found impracticable to carry this estimate beyond 1913. The uncertainties in it refer to the same countries as to which the figures representing production were doubtful, China and Japan. The estimated production in the former country has been touched upon already: it not improbably errs on the side of excess. Japan is mostly credited merely with the consumption of the difference between the home production and the export as given in the official figures, without any allowance for her imports. These, however, apparently consist mainly of cocoons and of raw wild (tussah) silk.

United States.—The most striking feature in the history of silk-manufacture during the last fifty years has been the constant and rapid advance in the amount and value of the imports of raw silk, and the manufactured output, of the United States. The following table shows

that the figures attained, though colossal, and now representing about half the world's production, have been reached by a constant and steady advance from 1870 onwards, when measured at decennial periods.

GROWTH OF SILK MANUFACTURE IN THE UNITED STATES

(From data of the Bureau of Statistics, Department of Commerce, "The American Silk Journal," 38, p. 60, and other sources.)

Year.	No. of establishments.	Capital. Dollars.	No. of wage-earners.	Raw silk used. lb.	Cost of materials. Dollars.	Approximate value of product.
1850	67	678,300	1,723	*	1,093,860	£ 376,974
1860	139	2,926,980	5,435	462,965	3,901,777	1,376,618
1870	86	6,231,130	6,649	684,488	7,817,559	2,500,000
1880	382	19,125,300	31,337	2,690,482	22,467,701	8,300,000
1890	472	51,007,537	49,382	6,376,881	51,004,425	17,500,000
1900	483	81,082,201	65,416	9,760,770	62,406,665	21,500,000
1905	624	109,557,000	79,601	11,572,783	75,861,000	27,768,333
1910	852	152,158,000	99,037	17,729,306	107,767,000	41,023,333
1914	902	210,072,000	108,170	25,021,945	144,442,000	52,918,958
1918	*	*	*	34,500,000	181,125,000	75,000,000
1919	*	*	*	37,485,000	200,000,000 ¹	104,166,666 ¹

* Figures not available.

¹ Estimate (Journ. Soc. Arts, 67, 750).

During the present century, while the European consumption has increased slowly, but on the whole steadily, the American, when considered year by year, exhibits various abrupt and violent fluctuations which have given it a dominating influence on market prices. The following table shows these contrasting details of growth of consumption (in lb.).

	Europe.	United States.		Europe.	United States.
1901 .	28,742,340	11,660,000	1909 .	30,806,600	22,083,600
1902 .	28,572,500	13,200,000	1910 .	33,078,996	22,110,080
1903 .	26,402,860	11,220,000	1911 .	29,913,030	22,300,000
1904 .	28,699,000	16,027,000	1912 .	32,021,010	24,657,600
1905 .	24,989,800	15,281,200	1913 .	30,526,020	27,016,000
1906 .	29,665,600	16,658,400	1914 .	—	28,595,000
1907 .	30,538,200	15,675,000	1915 .	—	26,031,000
1908 .	28,837,600	18,818,800	1916 .	—	33,071,000
			1917 .	—	33,075,000

Beyond its rapidity of growth, the American consumption of raw silk in manufacture exhibits two striking features, its increasing dependence upon Japan for the raw material and the almost complete consumption of the manufactured goods within the country. Between 1905 and 1910 the United States took from 65 to 75 per cent. of the Japanese export; in the latter year it was noted that she was buying less from Italy and France, and that the Japanese spinners were making every effort to meet special American requirements; and from 1914

America has taken 83 per cent. of the Japanese export. In spite of a protective tariff, American production has only been supplying about five-sixths of her consumption of manufactured silk, having an import of about eight million sterling in annual value, nearly half of which came from France. The manufacture has become concentrated in proximity to the iron industries of New Jersey, Pennsylvania and Connecticut, which employ large numbers of men whose wives and daughters have provided an abundant supply of efficient labour ; and manufacturing enterprise has made effective use of constantly renewed and specialised machinery. The published figures show that the export of manufactured silk is but a very small proportion (1-5 per cent.) of the output. An American Commerce Report for September, 1919, states that " the noticeable feature of the situation is that it is the working class which has benefited largely by the war, and which is chiefly responsible for the high cost of all articles owing to its demand for better clothes, better food, and the higher standard of living. Everyone in America to-day wants silk clothing instead of the linen or cotton to which he or she has been accustomed, and, if people can afford to buy a silk garment at all, they are not so very much concerned about the cost of it. As Japan is by far the largest producer of silk, it commands the situation, and if Japan silk is higher in price it is reflected more or less in other producing countries. The demand in America is increasing largely, and the world's supply at the present moment is quite inadequate." At the same time, the manufacturers were experiencing an alarming scarcity of female labour. Foreign immigrants who had been earning triple their pre-war wage had returned to their own lands ; temporary women munition-workers were remaining in the metal trades in which they can now earn higher wages ; and, owing to the advanced rates of pay in all industries, wives and daughters no longer find it necessary to work, and children are kept longer at school.

France.—In spite of the decline of her home production and of the competition of German, Swiss, Italian and Russian manufactures in the European market, France has for some years maintained a very uniform consump-

tion of about 9,400,000 lb. of raw silk, second only, that is, to the United States, in the silk-manufacture of the world, her supplies being drawn from various sources, Syrian, Japanese and Chinese more especially. In the early part of the last century the Jacquard looms of Lyons showed themselves as adaptable to the changing demands of fashion as had her handlooms in previous times ; but, failing to realise the greater rapidity of fashion changes due in large measure to the introduction of the sewing-machine, her manufacturers persisted in producing brocades which were too durable and too costly for the widening market, until their German and Swiss competitors had stepped in to supply the demand for cheaper goods. Both French and American silk-buyers seem alive to the prospective inadequacy of the Japanese supply, and to the consequent desirability of improving both in quality and quantity the next most available source, that of China. There is at present in that country hardly any selection of eggs, the worms are overcrowded and insufficiently fed, so that nearly 75 per cent. of those hatched die before spinning, and an ounce of eggs produces 15 to 25 lb. of cocoons instead of the 110-133 lb. obtained elsewhere ; the mulberries also are stated to produce only two-thirds of what they might. The existing area and number of workers should yield from twice to five times as much as they do. The French Chamber of Commerce at Shanghai is establishing a central Sericultural Institute with local branch schools ; in conjunction with the Foreign Silk Association and the Chinese Chamber of Commerce, they have formed a Committee to expedite improvements ; and the Silk Association of America has sent representatives to China, armed with cinematograph films, to teach improved methods of rearing and reeling.

Germany.—Assisted in its home market by a protective tariff, and by a labour supply, like that of the United States, in cities largely engaged in hardware, such as Elberfeld, Barmen and Crefeld, the German manufacture of imported raw silk has grown slowly, but on the whole steadily, during the present century, the imports rising from 6,569 metric tons, value £7,350,000, in 1902 to 8,601 tons, value £9,288,650, in 1912. With careful considera-

tion for the demand, Crefeld first specialised in cheap velvets, mixed with spun silk ("tussah") and cotton, and more recently has consumed large quantities of artificial silk both of German manufacture and imported.

Switzerland.—Before the war, the Swiss import of unmanufactured silk had ranged during the century about 5,000–6,000 metric tons per annum, some 4,000 tons being raw, thrown or spun silk from Japan, France and Italy, and the rest "waste." Of these amounts 3,000 tons of raw and 1,000 tons of waste were re-exported, largely as spun and schappe yarns, to Germany and other continental countries. The number of looms in the country declined from 16,000 in 1910 to 14,600 in 1912, and the production of broad silk (the centre for which is Zurich) from 53,500,000 yards in 1908 to 50,000,000 in 1910 and 46,500,000 in 1912. Almost all the manufacture is exported, and formerly Zurich sent 70 per cent. of her production to the United Kingdom; but though, since the removal of the war embargo on Swiss exports, the amount taken by the United Kingdom has increased above that taken in 1913, and the value is more than four times what it was then, the amounts taken from Japan, and still more from the United States, have increased in a higher proportion. The ribbon manufacture at Basle, one of the largest in the world, is, on the other hand, expanding, the production in 1916 being 500 tons (value £2,924,560) of which 360 tons (value £1,745,280), came to the United Kingdom. In 1920 the United Kingdom import reached a value of £3,204,541.

Russia.—Up to the outbreak of war, revolution and anarchy, the Russian silk industry seems to have been developing somewhat rapidly. While the import of manufactured silk had more than doubled during the century, from a value of £472,600 in 1902 to one of £1,058,462 in 1911, the import of raw silk (mainly from Italy and Japan) increased from 3,153,150 lb. in 1903 to 3,792,600 lb. in 1911; and most of the silk produced in the Empire was woven in the environs of Moscow. The production in the Caucasus was about a quarter of the amount consumed in the home manufacture. The establishment of low through rates for silk from Japan to

Moscow, and the German and Austro-Hungarian frontiers, by the Trans-Siberian Railway from the beginning of 1913, by which it could reach the Russian manufacturing centre in a month instead of the two and a half months occupied in its transport via Marseilles, was presumed to be intended to have rendered Russia independent of the Lyons market, and to have made Moscow a market for the supply of Japanese silk to the whole of Europe. (*F.O. Consular Reports, Annual Series, No. 5,324, Lyons, 1913, p. 14.*)

United Kingdom.—Although, as compared with those of the countries already discussed, the volume of British silk manufacture and export is small, the industry in this country has had a long and interesting history, and it now occupies a technical position far superior to, and independent of, its commercial importance. There was a manufacture of ribbon, or narrow silk, by women, in London, as early as 1363, the raw silk being imported from Italy. When, at the beginning of the seventeenth century, the weaving of broad silk was introduced, we were dependent on Turkey for raw silk, though efforts were made to obtain a Persian supply through Russia. By 1680 there are said to have been 40,000 persons employed upon silk in England, and the East India Company was beginning that import of Persian, Indian and subsequently Chinese raw silk by way of the Cape which made London the chief raw silk mart until the middle of the nineteenth century. The manufacture, however, began its period of greatest prosperity after the Huguenot immigration of 1685. It flourished at numerous scattered centres, in part owing to the availability of partly skilled labour, and of machinery employed in pre-existing textile industries, together with the prohibition from 1701 of the import of either thrown or manufactured silks from Persia, India or China. In 1713 there were stated to be 300,000 persons employed in the industry in England, and our manufacture was twenty times as great as it had been fifty years before. English silk-weaving would seem to have begun to decline probably from competition with the output of the Jacquard looms of Lyons, before the removal of the protective import duties in 1860. In

1851 there were 130,000 silk-weavers in England, in 1859 there were 70 or 80 ribbon manufacturers, employing from 10,000 to 12,000 weavers between them, in Coventry alone ; and Macclesfield had 5,000 to 6,000 looms ; but, from the removal of the import duty on manufactured silk, " the decline of the industry has been both rapid and continuous " ; and when the opening of the Suez Canal in 1869 so diverted the traffic that Chinese and Japanese silk came direct to Marseilles, Lyons and Milan superseded London as the distributing centres of the world's silk crop. Labour in Cheshire, Derbyshire and Yorkshire was largely drawn away to the more profitable woollen and cotton industries, and it became impossible for British manufacturers to compete in the production of cheap dress silks with continental looms employing labour at less than half the rate of wages in England. The rate of decline is clearly shown by the numbers of the workers in the manufacture in England and Wales in successive decades, which were as follow :

1851	.	130,723	1881	.	64,835	1907	.	29,278
1861	.	116,320	1891	.	52,027			
1871	.	82,963	1901	.	39,035			

The manufacture of cheap dress silks has gone to Switzerland and Italy, where labour is much cheaper, and that of thrown silk to the latter country (Sir Frank Warner, in *Journ. Soc. Arts*, 52 (1904), p. 124 and 60 (1911-12), p. 393). Many of the weavers emigrated from Macclesfield (where the number of looms had by 1904 fallen to 1,250) to Patterson, in New Jersey, the centre of American silk-weaving ; and the concluding figures of the above table would have shown a still steeper decline if the manufactures of net¹ silk had not, especially after the inventions of the late Lord Masham, been to some extent replaced by the growth of the spun silk industry. Though mercerised cotton and artificial silk have to some extent taken away the market for some Chinese silk, and the schappe process (which is not permitted in England) enables continental spinners to produce from short cheap material a fairly even yarn with which we cannot compete in price, English spun yarns, made from " waste " silk

¹ Silk reeled from the cocoon.

(upon which 10,000 workers are employed at Brighouse alone) cannot be surpassed in quality.

The small remnant of silk manufacture in England has also maintained a very high standard of excellence in those high-priced brocades, velvets and other silks which can bear a high rate of wages ; and, especially at Macclesfield, Bradford and Leek, fully equipped technical courses of education have been maintained, in spinning, dyeing, design and weaving, which are most beneficial to other textile industries, as well as to the silk manufactures of the world.

The imports and re-exports of raw, thrown and waste silk into the United Kingdom between 1857 and 1914 are summarised in Rawley's *Economics of the Silk Industry*, p. 277 ; the imports and countries of origin of the raw silk are given in detail in the official *Annual Statement of the Trade of the United Kingdom* ; and the exports of manufactured silk from 1901 to 1914 in the *Encyclopædia Britannica* (ed. 11), vol. xxv, p. 105.

During 1920 the position of the raw silk trade has changed very much, the demand having ceased to advance, so that large stocks of raw material are accumulating in all silk-producing countries, and particularly in Japan.

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